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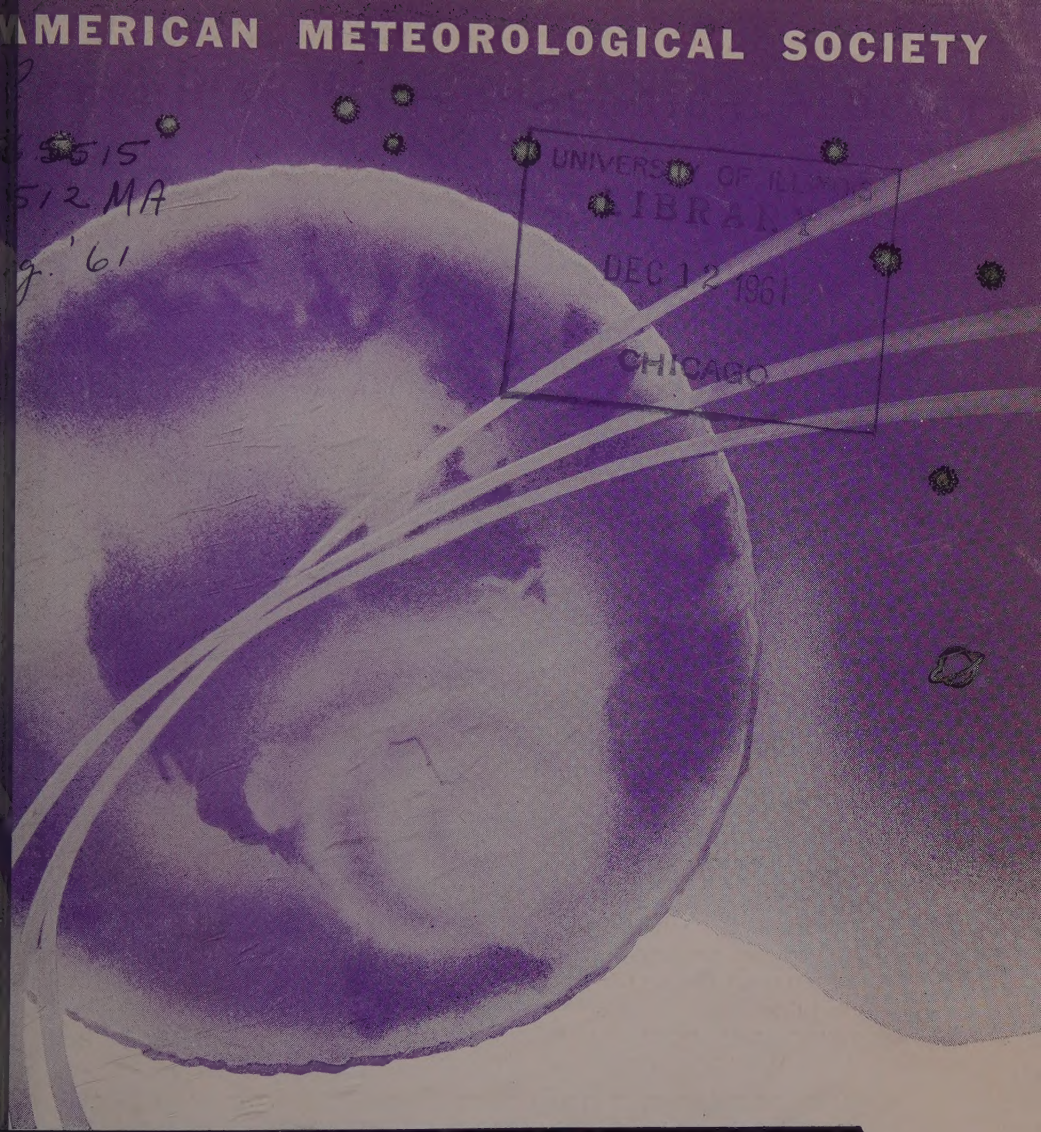

Meteorological & Geoastrophysical ABSTRACTS

Vol. 12 AUGUST 1961 NO. 8

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 12 August 1961 No. 8

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1919

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Special Feature in This Issue

Annotated Bibliography on Water Vapor Content of the Atmosphere Above 50,000 Ft.

By

Elemer Kiss

(For complete table of contents see back cover)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current literature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements	
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)	
7. Albedo	8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)		11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
7. Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology
10. Satellite Meteorology	11. Airglow	

Bibliographies in preparation or published in Vol. XII

. *Aurora*	4–6. *Upper Atmos. Structure*	9. *Planetary Atmospheres: General*
. *Auroral Physics*	7. *Precipitation Chemistry*	10. *Planet. Atmos.: Mars, Venus & Saturn*
. *Limnology*	8. *Upper Atmos. Humidity*	11. *Jovian Planets and Moon*

Part III contains a listing of reviews, translations, reprints, and the contents of important ublications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modification of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

A1. COLLECTED WORKS

See also: **Final Report 1956/1957 on Contract Cwb-9006** (Blue Hill Met. Obs.), 12.8–229.

12.8–1 523.7 525.723 551.593(08)

*†Tikhov, G. A., **Osnovnye trudy,** [Principal works.] Alma-Ata, Izdatel'stvo Akademii Nauk Kazakhskoĭ SSR, **1954–1960.** 5 Vol. Vol. 1, **Astrofizika,** 1897–1919. Issued **1954.** 333 p. Vol. 2, **Astrofizika i atmosfernaia optika,** 1910–1945. Issued **1955.** 381 p. Vol. 3, **Astrofizika,** 1912–1956. Issued **1957.** 233 p. Vol. 4, **Astrobotanika i astrofizika,** 1912–1957. Issued **1959.** 255 p. Vol. 5, **Botanika, Mars, Zhizn' vo vselennoĭ, fizika, astrofizika i atmosfernaia optika,** 1912–1958. Issued **1960.** 338 p. port., figs., tables, refs., eqs. throughout. At head of t-p.: Akademiia Nauk Kazakhskoĭ SSR. **DLC** (QB3.T5)—This collection of some 100 papers on astrophysics, atmospheric optics and planetary science, published over a period of 60 yrs, represents the author's work first at Pulkovo Observatory and later at Alma Ata, where he founded a Section of Astrobotany. Vol. 1 contains paper on stellar astrophysics, with emphasis on the propagation of light in the interstellar medium. Vol. 2 deals with planetary photography (including sample photographs of Mars and Saturn in black-and-white and color), reflection of light by the Moon and Earth, and atmospheric optics (scintillation, scattering, refraction, etc.). Vol. 3 is on solar observations (especially studies of the corona during eclipses), stellar spectroscopy and the deflection of light in stellar gravity fields. Vol. 4 contains some of the author's works on astrobotany (spectroscopic study of plants), astrobiology (principles of life in the Universe) and instrumental and observational aspects of photographic photometry and its application to planetary studies. Vol. 5 is divided into four sections. The first (p. 3–28) contains papers on spectroscopy of plants; the second (p. 29–159) on the planet Mars, its atmosphere, climate and suitability for organic life. The articles and polemic writings in this section were published both in the U.S.S.R. (mostly in the Proceedings of the Section of Astrobotany, Acad. of Sc., Kazakh SSR) and abroad. The third section (p. 160–236) deals with general problems of astrobiology and the fourth (p. 237–337) mainly with atmospheric optics. *Subject Headings:* **1. Astrophysics 2. Atmospheric optics 3. Mars 4. Sun's corona. I. Akademiia Nauk Kazakhskoĭ SSR.**—*G.T.*

12.8–2 551.588.6:551.579(08)

*International Union of Geodesy and Geophysics. Association of Scientific Hydrology, **[Transactions of the] Colloque de Hannoversch-Münden [Symposium of Hannoversch-Münden], Sept. 8–14, 1959.** Its *Publication* No. 48 and 49, pub. **1959.** 2 vol. Vol. 1, **Eau et régions boisées** [Water and woodlands]. 340 p. Vol. 2, **Lysimètres** [Lysimeters]. 169 p. both, figs., tables, refs. (For listing of contents, *see* 12(2):394, Feb. 1961, *Met. Abs.* These articles abstracted separately.) **DWB** (M79 1611co)—A collection of 35 papers presented at the symposium of Hannoversch-Münden on the subject of water and woodlands, held Sept. 8–14, 1959. The subjects vary from meteorological influence on forests to runoff from forests having various types of vegetation and various soil types. Water balance in forests is considered from a variety of perspectives. The effect of forests on regime of river flow or runoff is the subject of a few papers. All of the papers contain observational or experimental data. *Subject Headings:* **1. Forest-water balance relationships 2. Hydrology symposia.**—*E.Z.S.*

12.8–3 523.854/5

France. Centre National de la Recherche Scientifique, **Les recherches galactiques et extragalactiques et la photographie électronique.** [Galactic and extragalactic research and electronic photography.] (For listing of papers at this International Colloquium, *see* Pt. III, *Met Abs.* These papers abstracted separately *Annales d'Astrophysique*, Paris, 23(3):305–466, May/June **1960. DWB, DLC**—An International Colloquium on Galactic and Extragalactic Research was held in Paris from June 30–July 3, 1959 at the Astrophysical Institute, under the auspices of the French National Center for Scientific Research. This Colloquium was concerned with the impending initiation of the 193 cm-telescope at the Haute-Provence Observatory, and with the demonstration of the properties of the electron camera acquired at the Observatory of Paris by A. LALLEMAND and M. DUCHESNE. Twenty-four lectures were presented at this colloquium. *Subject Headings:* **1. Galactic and extragalactic research 2. Electronic photography 3. National Center for Scientific Research, Paris, 1959.**—*A. V.*

12.8–4 518.6(08) 521.1

Langer, Rudolph E. (*ed.*), **Frontiers of numerical mathematics: a Symposium conducted by the Mathematics Research Center [of] U. S. Army and the National Bureau of Standards at the Univ. of Wisconsin, Madison, Oct. 30–31, 1959.** Madison, Univ. of Wisconsin Press, **1960.** 132 p. Two papers of interest, abstracted separately are: Kopal, Zdeněk, **Numerical problems of contemporary celestial mechanics,** p. 45–58. Smagorinsky, J., **On the application of numerical methods to the solution of systems of partial equations arising in meteorology,** p. 107–123. **DWB** (510.82 L275fr)—The symposium held on the campus of the University of Wisconsin was not intended for the presentation of research results, but for the identification of some mathematical problems which have to be investigated for scientific advance. The other six of the eight papers presented at the symposium, which are not abstracted, deal with stress analysis in the plastic range, mathematical problems of nuclear reactor theory, aero-elasticity, operations research, mathematical bottlenecks in theoretical chemistry and magneto-hydrodynamics. *Subject Headings:* **1. Mathematics symposia 2. Celestial mechanics 3. Meteorological mathematics 4. Mathematical physics.**—*O.T.*

12.8–5 551.5:63(08)

Moscow. Tsentral'nyĭ Institut Prognozov, **Sbornik metodicheskikh uzazaniĭ po analizu i otsenki slozhivshikhsia i ozhidaemykh agrometeorologicheskikh uslovii.** [Symposium on methodical instructions on the analysis and evaluation of the established and expected agro-meteorological conditions.] Leningrad, Gidrometeoizdat, **1957.** 260 p. figs., tables, refs. For listing of articles (abstracted separately) *see* 11(10):173, Oct. 1960, *Met. Abs.* **DLC** (S600.M72)—Broad applications of the agro-engineering measures for maximum increase of agricultural production require consideration of special agro-climatic conditions of particular regions, zones or localities, and also the agrometeorological conditions for efficient growth of various types of crops in different years. This symposium contains newly developed and previously published methods of agrometeorological analysis and forecasting. The methods of forecasting described have differing accuracy; however, they are based on statistical analysis of numerous data of field studies and of observations during many years on the hydro-meteorological and agro-meteorological stations. The majority of these methods are still under investigation by the Scientific Research Institute of Main Administration on Hydrometeorological Services (GUGMS). The final results of these investigations will be published soon. *Subject Headings:* **1. Agrometeorological symposia. I. Kulik, M. S.** (*ed.*) **II. Moiseĭchik, V. A.** (*ed.*).—*N.P.S.*

12.8–6 551.590.21:551.586:612.11:541.124

*†Symposium International sur les Relations entre Phénomènes Solaires et Terrestres en Chimie-Physique et en Biologie, Uccle, Oct. 8–10, 1958, **[Proceedings of the Symposium held at the Royal Observatory of Belgium, Uccle—Brussels].** Brussels, Presses Académiques Européennes, **1960.** 210 p. figs., tables, refs., eqs. Contents (all articles abstracted separately): Piccardi, Giorgio, **Exposé introductif** [Introductory remarks], p. 9–20. Piccardi, Giorgio, **Les tests chimiques** [Chemical tests], p. 21–49. Capel-Boute, C., **Observations su**

les tests chimiques de Piccardi effectuées à Bruxelles de 1950 à 1958 [Observations on the Piccardi chemical tests, Brussels, 1950–1958], p. 51–111. Becker, U., **Sonnenaktivität und chemische Tests** [Solar activity and chemical tests], p. 113–119. Piccardi, Giorgio, **Une hypothèse solaire** [A solar hypothesis], p. 121–130. Quilghini, D., **Les éléments cinématiques du mouvement de la terre référé aux étoiles les plus proches du soleil** [Kinematic elements of the movement of the Earth with reference to the stars closest to sun], p. 131–137. Gião, Antonio, **Relativistic interpretation of the annual variation of the Piccardi physico-chemical D test and its cosmological meaning,** p. 139–158. Berg, Hellmut, **Relations entre phénomenès solaires et terrestres en biologie,** [Relation between solar and terrestrial phenomena in biology], p. 160–175. Vering, Fritz, **Nachweis extraterrestrischer Einfluesse auf mikrobiologische Systeme: ein biologischer P-test,** [Evidence of extraterrestrial influence on the microbiological system: a biological P-test], p. 177–189. **General discussion,** p. 190–201. **DWB** (M00.21 S989sy)—The aim of the symposium was essentially a critical examination and a synthesis of the observations carried out after 1950 by the "differential and statistical method of PICCARDI," who is Director of the Institute of Physical Chemistry of the Univ. of Florence. Explanatory hypotheses of "periodic fluctuations" observed in function of time, in the results of various inorganic physico-chemical tests links these to "solar activity" and to the movement of the Earth in the galaxy. A relativistic interpretation of a certain annual fluctuation is presented as a result of a general theory of universal gravitation. *Subject Headings:* **1. Physico-chemical processes 2. Solar influences on physico-chemical reactions 3. Biometeorological experiments 4. Symposia on solar-terrestrial effects on physico-chemical processes.**—*A.L.M.*

A2. TEXTBOOKS

12.8–7 551.509.33(02)

†Girs, A. A., **Osnovy dolgosrochnykh prognozov pogody.** [Fundamentals of long range weather forecasting.] Leningrad, Gidrometeoizdat., **1960.** 560 p. 164 figs., 32 tables, 557 refs., 41 eqs. **DWB** (M09.33 G528os)—This is the first comprehensive textbook on long-range forecasting in any language apart from BAUR's two volume (*see* 8.11–2, Nov. 1957; 10.7–3, July 1959 and 11A–Jan. 1960, *Met. Abs.*) guide which could be considered a text. This text, however, reviews in separate chapters not only the several Russian methods of the past decade or two (MULTANOVSKY, VANGENGEIM and BLINOVA), but those in vogue in the United States, Germany, France, China, Hungary, Romania, India, Japan, Indonesia and England and it also deals with the various systems or approaches to this difficult task. The first part of the book is devoted entirely to the theoretical and physical conditions connected with the general circulation and its seasonal or aperiodic anomalies that must be understood and forecast if 30-day or seasonal forecasts are to be effective. A chapter with considerable historical information follows the introduction and a review of much of the recent literature from non-Russian as well as Russian sources comprises the last six chapters. The 557 references consist of 332 non-Russian and 225 Russian citations (through 1959). The illustrative material consists of a variety of synoptic, mean, upper level, cross-section, schematic, anomaly, statistical and other types of charts and graphs, with a number of useful tables interspersed. *Subject Headings:* **1. Long range weather forecasting textbooks 2. Seasonal forecasting 3. Multanovskiĭ's method of long range forecasting 4. Blinova's method of long range forecasting 5. Vangengeim system of long range forecasting 6. Long range forecasting methods 7. U.S.S.R.**—*M.R.*

12.8–8 551.511.32:551.521.3:551.510:523.4(02)

†Sobolev, V. A., **Perenos luchistoĭ ĕnergiĭ v atmosferakh zvezd i planet.** [Transfer of radiant energy in stellar and planetary atmospheres.] Moscow, Gosudarstvennoe Ixdatel'stvo Tekhniko-Teoreticheskoĭ Literatury, **1956.** 391 p. 24 figs., 37 tables, 103 refs., 1279 eqs. **DWB** (523.8 S677pe)—A standard textbook on radiative transfer applicable to terrestrial, planetary, solar or stellar atmospheres, and based on the classical works of RAYLEIGH, MIE, SHULEĬKIN, EDDINGTON, SCHISTER, MILNE, SCHWARZSCHILD, RAMAN and others, and the recent theoretical work of CHANDRASEKHAR, AMBARTSUMIAN, VAN DE HULST, MENZEL, MINNAERT, FESENKOV and others. The ten chapters cover: I. General problems and theory; II. Methods of solution; III. Solution of complex diffusion problems by layer methods;

IV. Linear integral equations for obtaining the coefficient of brightness; V. Polarization of scattered light in the atmospheres of the earth and of planets, stars and in deep stratified media; VI. Probability of quanta emerging from a medium; VII. Emitting median bounded by reflecting surfaces; VIII. Diffusion of illumination with partial transfer; IX. Nonstationary fields of illumination; X. Approximate solutions of basic problems such as planetary atmospheres or the sea. *Subject Headings:* **1. Radiant energy transfer textbooks 2. Radiation in planetary atmospheres 3. Stellar atmospheres 4. Optics of the sea.**—*M.R.*

12.8–9 551.1:550.3(02)

†Haalck, Hans (*Prof., Geodatischen Inst., Potsdam*), **Physik des Erdinnern.** [Physics of earth's interior.] 2d. enl. ed. Leipzig, Akademische Verlagsgesellschaft Geest and Portig K.-G., **1959.** 310 p. 110 figs., 32 tables, 202 refs., 36 eqs. **DLC** (QE501.H235 1959). Price: DM 29. Review by K. Jung in *Beiträge zur Geophysik*, Leipzig, 69(1):62–63, **1960.**—An advanced geophysical text which treats the physics of the earth's interior. The study begins with a discussion of the fundamental concepts of the phase of the material in the earth's interior, the shape and size of the earth, astronomic phenomena, earth tides, rotational variation, and continues with consideration of seismological phenomena which contributes to a better understanding of the earth's interior. In the following sections, the density distribution in the interior, gravity, pressure, elasticity and viscosity as functions of depth are considered. The heat budget of the earth, composition of the earth, constitution of the outer layers of the earth's crust, tectonics, and magnetism are treated in subsequent sections. The final chapter contains a discussion on work methods used in applied geophysics: gravimetric, magnetic, seismic and electric. Geophysical constants and units of measurement are given in a separate section. The text is interspersed with significant data and illustrations. *Subject Headings:* **1. Geophysics textbooks 2. Earth's crust 3. Earth's interior.**—*E.Z.S.*

12.8–10 551.579:551(02)

†Bogomolov, G. V., **Grundlagen der Hydrogeologie.** [Fundamentals of hydrogeology.] Berlin, Deutscher Verlag der Wissenschaften, **1958.** 178 p. 104 figs., 18 tables, bibliog. p. 175–178, eqs. Price: DM 20, 60. **DLC** (GB1003.B615). Transl. of the original Russian, **Osnovy gidrogeologii,** pub. Moscow, **1955.** Review by N. Kingo Jacobsen in *Geografisk Tidsskrift*, 59:304, **1960.**—A text on the fundamentals of hydrology translated from the Russian book published in 1955. Following a brief outline of the development of hydrogeology, separate chapters are devoted to detailed treatment of water in the atmosphere and on the earth's surface; water in the earth's crust; the physical properties and chemical composition of ground water; short discussions on the dynamics of ground water; the important types of ground water and several types of hydrogeological investigations. Schematic diagrams and cross sections illustrate the text. *Subject Heading:* **1. Hydrogeology textbooks.**—*E.Z.S.*

12.8–11 551.501.81(02)

Sivers, A. P.; Suslov, N. A. and Metel'skiĭ, V. I., **Osnovy radiolokatsii.** [Principles of radar.] Leningrad, Gosudarstvennoe Soiuznoe Izdatel'stvo Sudostroitel'noĭ Promyshlennosgi, **1959.** 347 p. 237 figs., 3 tables, numerous eqs. **DWB** (621.381 S6240s)—A complete textbook coverage of the subject of radio location by various methods, including types of equipment, analysis of errors, static or interference and counter measures, use for various purposes, compilation of data, operation of stations, types of stations (for observation of rockets, satellites, airplanes or ships, for use on airplanes or ships, meteorological (weather) radar, balloon tracking radar, etc.). Simple equipment as well as examples of the more complex modern radar are described in great detail, especially that used in the U.S.S.R. for determining elevation, azimuth and distance of objects from the ground or air. Profuse use of schematic diagrams and other illustrative material helps the reader understand the theory and principle. *Subject Headings:* **1. Radar textbooks 2. Radio location equipment 3. Soviet radio location systems.**—*M.R.*

12.8–12 551.507.362:629.19(02)

*†Ehricke, Krafft A. (*Program Dir., Centaur-Vega Project Convair (Astronautics), General Dynamics*), **Space Flight, Pt. 1, Environment and celestial mechanics.** Princeton, N. J.,

D. Van Nostrand, Inc., 1960. 513 p. 130 figs., 23 tables, 192 refs., 296 foot-refs., 748 eqs. (**Principles of Guided Missile Design,** ed. by Grayson Merrill, Vol. 6, Pt. 1.) Price: $14.50. **DLC** (UG630.P72)—A textbook written for students of astronautics. Its purpose is to provide the student with some of the foundations he will need in applying his own capabilities to the advancement of the sciences and technology of flight through space. This volume of the text of **Space Flight** treats the subjects of environment and celestial mechanics. Vol. II will treat the subject of **dynamics,** and Vol. III, **Space Operations.** The first chapter of this volume traces the development of the space flight concept through the early mythical stages, through the growing scientific understanding of man's cosmic environment and the laws of nature, and from there to the birth of the early technical concepts developed by the first generation of modern pioneers, and further on to the era of the missile, the high altitude rocket. The chapter ends with a discussion of the principal factors which might influence space flight in the near future. The second chapter deals with the utility aspects of space flight. It presents a discussion of the interdependence of utility and evolution of space flight and concludes with a discussion of various types of instrumented space vehicles and the aspects of introducing man as an active participant in space operations. The third chapter provides a basis for understanding the environment in which space flight will take place, that is, the radiation and particle "climate" in space which is non-aerodynamic, yet anything but empty, and the conditions on the surface and in the vicinity of all major planetary and satellitory bodies in the solar system so far as we know, or understand them today. The second part of the volume is devoted to the study of celestial mechanics. Emphasis is placed on those aspects which are of particular or potential importance in the orbital dynamics of space vehicles. The three chapters of this part deal with the central force field, orbit determination, and perturbation analysis. The fourth chapter treats the central force field in general, circular and radial motion, the elliptic, parabolic, and hyperbolic orbit and the two-body system. It concludes with a comprehensive collection of formulae, arranged explicitly and alphabetically in terms of 26 parameters, as well as a number of their first and second order time deviratives. In the fifth chapter, all orbital elements are derived and a variety of coordinate systems and their transformation is presented and then followed by a discussion of units of time and concludes with a discussion of the treatment of various aspects and methods of orbit determinations. Chapter six is devoted to perturbation analysis. It includes a discussion of the case of perturbations at close proximity to the disturbing body, defining the activity sphere of a celestial body, of the determination of the orbital elements from rectangular coordinates and of the determination of rectangular coordinates from the orbital elements. Every attempt has been made to render the book useful to application in research and development work, preliminary design and systems analyses. For this purpose comprehensive data tables on the bodies of the solar system are provided, the grid of many graphs are kept fine enough for accurate reading and formulae summarized or tabulated. *Subject Headings:* **1. Astronautics textbooks 2. Celestial mechanics 3. Space flight.**—*E.Z.S.*

12.8–13 551.579(09)(47)

†Fedoseev, I. A., **Razvitie gidrologii sushi v Rossii.** [Development of hydrology in Russia.] Moscow, Akademiia Nauk SSSR, **1960.** 301 p. numerous figs., tables, foot-refs., eqs. Bibliog. p. 289–301 (322 refs.). **DWB** (M79/47 F294ra)—A sizeable book giving a great deal of historical information on 17th, 18th, 19th and early 20th century expeditions, developments of equipment and methods, networks, services, and theories of hydrology, hydrography, and related subjects, in Russia prior to the Revolution. The six major sections cover: I. Early attempts at charting the waters of Russia and Siberia from the 9th and 10th centuries up to 1700; II. Hydrographic expeditions and research in the first quarter of the 18th century; III. Hydrography to the end of the 18th century; IV. Hydrographic research and development of hydrology in 1875; V. Water research in the last quarter of the 19th century: the beginnings of hydrology as an independent science (includes work of A. I. Voeĭkov, study of channel processes, governmental and agricultural interests, etc); VI. Hydrology from 1900–1917 (including study of ice phenomena, river runoff, etc.). In addition to ample foot-note references, there is a bibliography of over 300 Russian and 11 non-Russian sources appended. A number of schematic diagrams illustrate some of the developments mentioned in the text and some of the early maps or literary sources are reproduced by facsimile. This might be

considered a companion volume to that covering the history of meteorology up to the Revolution by A. Kh. Khrgian (*see* 11A–57, Jan. 1960, *Met. Abs.*) *Subject Headings:* **1. History of Russian hydrology 2. Hydrological development in Russia 3. U.S.S.R.**—*M.R.*

12.8–14 551.5:574

*†Reiter, Reinhold, **Meteorobiologie und Elektrizität der Atmosphäre.** [Meteorobiology and atmospheric electricity.] Leipzig, Geest & Portig, **1960.** 424 p. 135 figs., 58 tables, (some fold. tipped inside back cover) bibliog. p. 381–402. (*Probleme der Bioklimatologie*, Vol. 6.) **DLC** (QH543.R4)—The author's purpose is to distinguish between coincident and causality in the relationship between specific biological conditions and atmospheric phenomena. After describing the pertinent atmospheric conditions he uses various statistical devices to test and prove their coincidence (time 1) with specific biological reactions, giving abundant references to data and opinions of others. Infolded pages tabulate the "synchronizations" he finds. The six major headings are: 1) Introduction to the problem and its historical development. 2) Nature characteristics and connections between weather and the indicator elements. 3) Meteorobiological investigation of the basic-electrical-atmospheric indicator elements. 4) Sun eruptions, their relation to weather and to the life of people. 5) Retrospect and general conclusions of the relationship between weather and people. 6) On the significance of atmospherical electrical elements as causal factors. Some of the usage of terms is explained in a separate section. An extensive bibliography, an author index and a subject index are provided. *Subject Headings:* **1. Biometeorology 2. Climatic effects on health 3. Atmospheric electricity effects on health.**—*E.Z.S.*

A3. BOOKS AND MONOGRAPHS

See also: **Climat. data of 1621–1650 according to obs. of Count Herman IV of Hesse** (Lenke), 12.8–60; **Longitudinal range control during satellite re-entry** (Assadourian, Cheatham), 12.8–78; **Absolute topography of 850 mb, 700 mb and 300 mb for 1900–1939, N. Hemisphere** (Hennig), 12.8–236; **Upper wind distribution** (Crutcher), 12.8–237; **A radiometer for the hydrogen line** (Höglund, Radhakrishnan), 12.8–245; **Tropical met.** (Wexler, Malkus), 12.8–359.

12.8–15 551.582.1(791)

†*Arizona. University. Institute of Atmospheric Physics, **Arizona climate.** Prepared by the Institute with the cooperation of the U. S. Weather Bureau. Ed. by William D. Sellers. Tucson, Univ. of Arizona Press, Sept. **1960.** 60 p.+numerous tables. 19 figs., 4 tables, 28 refs. p. 4–57, Sellers, William D., **Climate of Arizona. DWB** (M82.1 A719ar), **DLC**—This is detailed report on the climate of Arizona. The factors dealt with in this report include physical features, precipitation, temperature, surface winds and cloudiness. As the figure shows, Arizona is divided into six sections. The vegetation and the physical features are described in detail. The precipitation data was collected by 270 climatological stations. In the northeast and the southwest sections of the state, precipitation is less than 10 in. every year, the country around Yuma getting less than three in. The summer precipitation in Arizona is of convective origin resulting from the flow of moist tropical air from the Gulf of Mexico over strongly heated mountainous terrain. Both January and July show large temperature variations throughout the state. In January the values range from 20 to 55°. In July they range from 55 to 95°. The plateau section of the state records relative humidity up to 75% from early July through mid-September. The data on winds and cloudiness is not very reliable. At the end of the report climatographies of different stations in Arizona are given. Various tables, figures and graphs are included. *Subject Headings:* **1. Climate of Arizona 2. Climatic data for Arizona 3. Arizona.**—*A.H.K.*

12.8–16 551.589(711) 551.577.5:551.43(711) 551.524:551.43(711)

*†Walker, Edward F., **A synoptic climatology for parts of the Western Cordillera.** McGill Univ., Arctic Meteorology Research Group, Contract AF 19(604)-3865, Scientific Report No. 8; Publication in Meteorology No. 35, Feb. **1961.** 218 p. 38 figs., 14 tables, numerous charts, bibliog. p. 155–164. **DWB**—The problem was to explain effects of mountain terrain, the

Canadian Cordillera, on distributions of precipitation and temperature. Techniques from several fields of meteorology were blended with modern data processing in an attempt to overcome the sparseness and non-representativeness of weather observations. Atmospheric characteristics over British Columbia were found to be sharply differentiated by the direction of the flow at the 700 mb level. Linearized two-dimensional mountain airflow theory was combined with relevant atmospheric characteristics to derive simple models of precipitation distributions over mountain ranges. These models were used to supplement observations to obtain improved charts of precipitation over the southern half of British Columbia. Altitudinal variation, and other characteristics of the distributions of precipitation and temperature not hitherto available were elucidated. The relationships obtained between atmospheric characteristics and observed weather suggest that it may be practicable and economical to observe the climate of sparsely settled mountainous areas using relatively few weather stations. *Subject Headings:* **1. Synoptic climatology studies 2. Orographic effects on precipitation distribution 3. Orographic effects on temperature distribution 4. British Columbia.**—*Author's abstract.*

12.8–17 631.4 551.582.1(479.1)

*†Rubilin, E. V., **Pochvy predgoriĭ i predgornykh ravnin Severnoĭ Osetii: proiskhozhdenie, svoĭstva i khoziaistvennoe ispol'zovanie.** [Soils of the foothills and the Piedmont plains of North Ossetia: morphology, characteristics and economical use.] Moscow, Akademiia Nauk SSSR, **1956.** 230 p. 32 figs., 75 tables, bibliog. p. 222–230. At head of t-p.: Akademiia Nauk SSSR. Pochvennyi Institut im. V. V. Dokuchaeva. **DLC** (S599.R9208)—A comprehensive geographical, geological or geomorphological monograph on the soil forming processes, soil types, and detailed soil analyses of the soils of the piedmont of North Ossetia region of the north central Caucasus. The two major parts of the book are concerned with: I. the 1) geology and relief, 2) soil formation, 3) climate (p. 35–40), 4) vegetation, 5) history of research and results of investigations and 6) general laws of distribution of soil types, and II. characteristics of 1) forest, 2) clay, 3) chernozem and 4) alluvial soils, respectively. The latter four chapters constitute by far the largest part of the book (p. 66–213), with profuse tables, diagrams, analyses, and other illustrative material. The bibliography of about 250 Russian and about 50 non-Russian references is very thorough and up-to-date. *Subject Headings:* **1. Soil survey monographs 2. Climate of North Ossetia 3. Soil types 4. North Ossetian A.S.S.R.**—*M.R.*

12.8–18 551.506.1

*†U. S. Argonne National Laboratory, **Radiological Physics Division semiannual Report, Jan.–June 1959,** on Contract W-31-109-eng-38, issued Oct. **1959.** 101 p. 28 figs., 21 tables, refs. at end of each ch., numerous eqs. **DWB** (539.7 U581ra) –Among the qualitative descriptions of various studies and instrumentations included in this semiannual report Jan.–June 1959 are: soil temperature analysis and its interrelation with meteorological factors, automatic meteorological data processing and the atmospheric diffusion studies so far completed. To arrive at some conclusions as to the climatology of a site, processing details must be applied to the meterorological measurements for that site. The Datex Corporation manufactures annually the processing equipment described here. Over 200,000 meteorological measurements are handled annually by the automatic system. The paper also includes ways of measuring cosmic ray neutron background by the use of the "twin" scintillation fast neutron spectrometer described herein. *Subject Headings:* **1. Soil temperature analysis 2. Meteorological data processing 3. Atmospheric diffusion.**—*N.N.*

12.8–19 551.510.72

*†Rajewsky, Boris et al., **Strahlendosis und Strahlenwirkung: Tafeln und Erläuterungen: Unterlagen für den Strahlenschutz.** [Radiation dosage and effects. Tables and explanation. Data for radiation safeguards.] 2d ed. enl. and rev. Stuttgart, G. Thieme, **1956.** 3 parts separately paged. 84 p. of text, Section of tables A–O, separately paged, and bibliog. of 280 p. (incl. index to bibliog.) **DLC** (QH652.R33 1956). First ed. issued 1954. **DLC** –The first part discusses radiation, reaction to and injuries from radiation; acute radiation illness; single short time radiation on the entire body; the time factor of dosage distribution; long period

radiation; radiation of body parts; reaction of organs; blood and blood building organs; radiation cancer; genetic radiation effects; the relative biological effectiveness of various ionizing rays; permissible quantities of radioactive isotopes in the human body. An explanation and definition of terminology is followed by details concerning atomic explosions. Two bibliographies and a monograph list provide references in English, French, Italian and German. *Subject Headings:* **1. Radiation hazards 2. Atomic radiation bibliographies 3. Atomic explosion effects.**—*E.Z.S.*

12.8–20 551.578(438)

*Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, **Grady w Polsce.** [Hail in Poland], 1953. Issued **1959.** 121 p. Almost entirely tables. 4 maps (fold). (Its *Seria Roczniki*) Table of contents and preface in Polish and French.—This publication consists of tabulated data on the frequency and distribution of hail in Poland during 1953. Inserted maps show the areal distribution and amount of damage to tobacco, orchards, vegetable gardens, and weeds. *Subject Headings:* **1. Hail frequencies 2. Hail damage to plants 3. Poland.**—*E.Z.S.*

12.8–21 551.524.731:551.547.31:551.510.52/3

†Matzke, Horst, **Über die Korrelation interdiurner Druck- und Temperaturänderungen in der Troposphäre und sich ergebende Folgerungen für Tropo- und Stratosphäre.** [Correlation between diurnal pressure and temperature variations in the troposphere and its consequences for the troposphere and stratosphere.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen,* 7(52), **1960.** 56 p. 11 figs., 11 tables, 165 refs., eqs. **DWB, DLC**—A mathematical exposition of the derivation of

$$\gamma^2(\delta Pz,\delta Po) \geqq 1 - \left(\frac{gzPz}{RT^2m}\right)^2_3 \frac{\sigma^2\delta Tm}{\sigma^2\delta Pz^4}$$

which expresses the relationship between daily temperature variations and daily pressure variations at varying altitudes above sea level. A map shows the stations from which the data were collected, tables list source and relative values for each element at the given time. *Subject Headings:* **1. Diurnal tropospheric temperature variations 2. Diurnal tropospheric pressure variations 3. Stratospheric effects of diurnal pressure-temperature variations.** —*E.Z.S.*

12.8–22 551.322

*†Khrushchov, M. M. and Berkovich, E. S., **Izuchenie tverdosti l'da.** [Study of hardness of ice.] Moscow, Akademiia Nauk SSSR, **1960.** 48 p. 23 figs., 6 tables, 25 refs., numerous eqs. **DWB** (551.31 K45iz)—A study of physical and mechanical properties of ice is described with details and with graphic illustrations of the variation of the ice hardness with the factors of testing conditions. Basic methods of testing hardness, adopted in different countries, are outlined and accompanied by the authors' analysis and correlation of the results. The following basic principles are adopted for the indication of ice hardness: (1) measurement of scratch made on the ice surface, having a definite temperature, by a sharp pyramidal tool of different materials; (2) measurement of the dent size left by the pyramidal tool under a definite pressure acting during a definite time; (3) measurement of the depression made by a standard hard steel ball with a definite force acting during a definite period of time. *Subject Headings:* **1. Ice properties 2. Ice hardness.**—*N.P.S.*

12.8–23 91.04(99):778.3

*Schulthess, Emil, **Antarctica; Pa photographic survey.** English translation by Peter Gorge]. N. Y., Simon and Schuster, **1960.** unpaged. 173 photos, illus. (part col.), maps, diagrs. Partial contents: Dufek, G. J., **Operation Deep Freeze IV.** Dater, H. M., **Science in Antarctica. DLC** (G870.S343)—This book contains 173 excellent photographs of life in Antarctica as witnessed and experienced by the scientists of the 12 member nations cooperating during operation Deep Freeze IV, during IGY. They show the members of the expedition at work. They also show the rocks and vegetation of Antarctica as well as its animal life.

Some outstanding photographs include: the exact geographic position of the South Pole, the geomagnetic laboratory at Little America V, the release of a meteorological balloon, tracking of the balloon with GMD-1A receiver, the course of the sun, floating ice, sunset near the coast of Wilkes Station. *Subject Headings:* **1. Photographs of Antarctica 2. Antarctica.**—*A.H.K.*

12.8–24 593.12 551.583.3(262)

*†Parker, Frances L., **Eastern Mediterranean foraminifera.** *Swedish Deep-Sea Expedition, 1957–1958, Reports,* Vol. 8 (Sediment Cores from the Mediterranean Sea and the Red Sea), No. 4, issued Göteborg, Dec. **1958.** 362 p. 6 plates, 20 tables, 73 refs. **DLC** (Q115.S94). Also issued as Reprint of California Univ. Scripps Institution of Oceanography under Contract Nonr-2216 and Project NR 083-005, Sept. 9, **1959.**—An analysis and interpretation of the foraminifera in sixty surface sediment samples collected at various depths in the eastern Mediterranean and Aegean Seas. The depth distributions of the various benthonic forms are defined and faunal limits delineated. Planktonic forms are described. The foraminiferal distribution in sixteen long cores, collected in the eastern Mediterranean Sea, provides a basis for a discussion of the age and correlation of the sediments. Detailed core descriptions, a section on the systematics of foraminifera, and six plates showing them are appended. Four new benthonic species and one new planktonic species were found. It is suggested that the two long cold intervals reflected by planktonic core faunas represent the last Glaciation (Würm I, II, III) and the long warm interval preceding them the last Interglacial (Riss/Würm). A warm fauna may reflect the "climatic optimum" of ⁰⁄5000 B.P. Sedimentation rates are calculated. *Subject Headings:* **1. Foraminifera distribution 2. Plankton distribution 3. Benthonic species distribution 4. Climatic changes 5. Aegean Sea 6. Mediterranean Sea.** —*E.Z.S.*

A4. HANDBOOKS—MANUALS

12.8–25 526.37:551.543(02)

*Petrov, Georgii Dmitrievich, **Barometricheskoe nivelirovanie pri vypolnenii gravimetricheskikh rabot.** [Barometric leveling for carrying out gravimetric surveys.] Moscow, Izdatvo Geodezicheskoi Literatury, **1959.** 107 p. 34 figs., 19 tables, 18 refs., (plus 15 figs. and tables in appendix). **DLC** (QC895.P4)—The principles (instruments and methods of field and observatory measurement) of barometric leveling for geophysical and topographic surveying are set forth in a systematic or textbook style in this pamphlet. The 6 chapters deal with: 1) basic principles, 2) calculation of meteorological factors (temp., pressure, diurnal variations, inhomogeneities, and calculation of barometric height), 3) instruments (mercurial and aneroid barometers, differential barometer for height measurements, baroleveler, hypsothermometer, barograph, photographic recording barometer, thermometer and psychrometer calibration of instruments and research), 4) methods of barometric leveling, 5) organization of field work of various types and circumstance, 6) calculation of heights and compilation of observational data, preparation of baric charts, accuracy, etc. Many computation and correction tables, nomograms, sample forms, charts and maps, especially for use in the U.S.S.R., are appended. *Subject Headings:* **1. Barometric leveling manuals 2. Barometers 3. Gravimetric field work 4. U.S.S.R.**—*M.R.*

12.8–26 52(02)

*Royal Astronomical Society of Canada, **The Observer's Handbook, Vol. 53, 1961.** Toronto, Ontario, 1960. 90 p. numerous figs., chiefly tables.—This publication represents the 53rd issue of **The Observer's Handbook.** The astronomical information contained in the previous issues has been revised and brought up to date for use in 1961. Several improvements and additions have been made in this issue. The additions consist of suggestions for the pronunciation of the names of the constellations, a finding list of named stars, a small map of the moon, and the maximum and minimum values of the moon's libration in longitude and latitude. More explanations are added for sidereal time and for the correction for longitude in changing from local mean to standard time. For the four brightest asteroids opposition ephemerides are given, together with a map of the path of Vesta near the time of opposition. *Subject Headings:* **1. Astronomy observers handbooks 2. Observers manuals. I. Northcott, Ruth J.** (*ed.*).—*I.S.*

12.8–27 551.586:633.491(02)

*†Cox, A. E. and Large, E. C. (*both, Plant Pathology Lab., Ministry of Agr., Fisheries, and Food, Harpenden, Eng.*), **Potato blight epidemics throughout the world.** *U. S. Dept. of Agriculture, Agriculture Handbook*, No. 174, **1960.** 230 p. 94 figs., 109 tables, 324 refs. **DLC** (SB608.P8C68). Review by P. M. A. Bourke in *WMO, WMO Bulletin*, 9(3):183, July **1960.**—This handbook reviews the conditions associated with the recent epidemics of potato blight throughout the world. Of special interest is the discussion of climatic conditions as they influence potato cultivation and the incidence of blight. In the section dealing with conditions in each country the cropping periods are related to the long term average rainfall and average daily mean temperature for each month of the year at representative weather stations. A number of small "climagrams" are constructed to indicate similarities and differences in widely separated parts of the world. *Subject Headings:* **1. Potato blight epidemics 2. Climatic conditions for potato cultivation 3. Potato blight handbooks.**—*I.S.*

A5. POPULAR SCIENCE BOOKS

See also: **90°South: story of American S. Pole conquest** (Siple), 12.8–44.

12.8–28 551.515(023)(02)

Battan, Louis J., **Nature of violent storms.** Garden City, N. Y., Doubleday & Co., **1961.** 158 p. 22 figs., 2 tables, 11 plates. (*Science Study Series*, No. S19.) Price: $.95. Vita p. 5. **DLC**—The pocket size book for secondary school and public use describes the nature and the causes of four different kinds of storms: thunderstorms, tornadoes, hurricanes and cyclones. Various theories of thunderstorms, tornadoes and hurricanes are dealt with. Thermals, convective clouds and the physics of vertical and rotary air motions are discussed in a lucid but thorough scientific manner. A number of excellent photos of tornadoes, hail radar echoes and hurricane clouds are included and a thorough index provided. *Subject Headings:* **1. Severe storms 2. Popular meteorology textbooks.**—*M.R.*

12.8–29 55(023)(02)

†Namowitz, Samuel N. (*Elijah D. Clark Jr. High School, N. Y.*) and Stone, Donald B. (*Mt. Pleasant H. S., Schenectady, N. Y.*), **Earth science: the world we live in.** 2d ed. Princeton, N. J., Van Nostrand, **1960.** 614 p. numerous illus. (photos, charts, diagrs.) refs. at end of most chaps. (For abstract on first edition, (*see* 6.4–2, April 1955, *Met. Abs.*) **DLC, DWB** (551.N174de)—An excellent senior high school textbook covering the following: the earth in regard to its land forms, history, oceans, climates, atmosphere, and the universe. This revised edition contains, among others, the following new additions; glossary (600 terms), four new chapters on Earth and its history, expansion and revision of chapters of the first edition, especially the unit on the earth and its atmosphere. The book contains many excellent photos and illustrative diagrams. *Subject Headings:* **1. Geophysics 2. Elementary meteorology textbooks.**—*Author's preface.*

12.8–30 523.3/4

Godwin, Felix, **Exploration of the solar system.** N. Y., Plenum Press, **1960.** 200 p. 22 figs., 9 plates, 19 tables, eqs. **DWB** (629.4501 C591ex), **DLC** (TL793.G6). Review by D. G. King-Hele in *Nature*, 187(4740):811, Sept. 3, 1960. This book attempts to outline the development of astronautics over the next hundred and fifty yrs but greatest emphasis is placed on possibilities in the near future. Trips to the moon, to Venus and Mars are foreseen and provisions are outlined for the construction of probes, spaceships and the preparation of expeditionary equipment and personnel. For each of the major destinations the assembly orbit is considered and the time necessary for actual voyages predicted: the Venus voyage time is calculated to be 146.1 days, Mars voyage about 260 days. Schematic diagrams of a solar-powered lunar vehicle, a lunar probe rocket, Venus manned spaceship, a Venus mobile robot and landing ship, and Mars manned spaceship and reconnaissance plane, are included. Appendices contain notes on rocket propellants, radio power requirements, costs, personnel, scheduling, space warfare and a list of estimated dates for the major developments including colonization and use of space stations. *Subject Headings:* **1. Solar system exploration 2. Moon exploration 3. Venus exploration 4. Mars exploration.**—*E.Z.S.*

12.8–31 523.3 521.1

†Brown, Ernest W. (*Haverford College, Pa.*), **An introductory treatise on the lunar theory.** N. Y., Dover Publications, Inc., **1960.** 292 p. 10 figs., foot-refs., 280 eqs. Price: $2.00. This new edition is an unabridged and unaltered republication of the first edition published by Cambridge Univ. Press, **1896. DLC** (QB391.B9 1960) —A treatise on the lunar theory (Three Body Problem). The first four chapters contain investigations of the form of the disturbing function, of the equations of motion, of the expansions relating to elliptic motion, and of the methods adopted in order to approximate to the solution. In Ch. 5, the equations for the variations of the elements in disturbed motion are obtained in an elementary way and also by the symmetrical method of JACOBI. The properties and methods of development of the disturbing function are collected in Ch. 6. The details of the second and of parts of the third approximation to the solution of de Pontecoulant's equation is found in Ch. 7. Ch. 8 is devoted to the arbitrary constants. Chs. 9 and 10 contain the theories of DELAUNAY and HANSEN. In ch. 11 an attempt is made to give a complete method for the treatment of the solar inequalities in the moon's motion, based on that initiated by HILL for those parts of them that depend only on the ratios of the mean solar and lunar motions. Ch. 12 considers other methods. In Ch. 13 the inequalities arising from planetary action and from the ellipticity of the earth are considered. *Subject Headings:* **1. Lunar theories 2. Three Body Problem 3. Celestial mechanics.**—*E.Z.S.* Ⓢ

12.8–32 546.212(023)

†Davis, Kenneth S. and Day, John Arthur, **Water: the mirror of science.** Garden City, N. Y., Doubleday & Co., **1961.** 195 p. 22 figs., 4 plates, 36 foot-notes. (*Science Study Series*, No. S18.) Price: $.95. Vita p. 3–4. **DLC**—Although intended for the "young student and laymen" this study of water includes much of general interest to scientists in various disciplines. It explains the properties and physical causes of the unusual properties of water; shows water as a geologic force and energy custodian, and includes a discussion of water as the seedbed of life. The book concludes with an explanation of some of man's water problems. *Subject Headings:* **1. Water 2. Popular science books.**—*E.Z.S.*

12.8–33 5(023)

Reinfeld, Fred, **What's new in science.** New York, Sterling Publishing Co., Inc., **1960.** 204 p. numerous figs. **DWB** (500 R367wh)—This is a popular narrative of recent scientific advancements in the fields of electronics, surface travel, medical and psychiatric research. Since the launching of the first artificial satellite on Oct. 4, 1957, space travel has become feasible. Nuclear energy is not exclusively applied for destructive purposes, but is being gradually tamed for constructive peacetime uses. In the field of meteorology efforts are being made to control weather and even climate. The usefulness of Vanguard II (launched in Feb. 1959) for weather forecasting is explained. The book contains numerous pictures of instruments and satellites. *Subject Heading:* **1. Popular science books.**—*H.M.*

A6. IGY—WMO

See also: **International met.** (Hesselberg), 12.8–37; **Radiation studies on south polar snowfield** (Hanson), 12.8–48; **Third World Met. Conf.** (Reichelderfer), 12.8–54; **Glacier studies of McCall Glacier** (Sater), 12.8–207; **Reports of Antarctic and N. Hemisphere glaciology program,** 12.8–216; **IGY station, San Salvador** (Möller), 12.8–228.

12.8–34 551.506.22(99) 551.5:550.3:061.3

Law, Phillip (*Antarctic Div. Dept. of External Affairs, Melbourne*), **The IGY in Antarctica.** *Australian Journal of Science*, Sydney, 21(9):285–294, June 21, **1959.** fig., 2 tables. **DLC**—This paper surveys the efforts made by 11 nations that have established stations and carried out geophysical and other investigations during the IGY in Antarctica. An attempt is made to give a complete picture of the IGY Antarctic program. Against a background of Antarctic geography, terrain, climate, the problems of planning various projects and accomplishments are discussed. The names of the Antarctic stations which have operated with wintering parties during the IGY are listed. For contrast, the comparable state of affairs in Antarctica in 1955

before IGY activity commenced is also tabulated. A map showing seismic ice-depth traverses made in Antarctica prior to 1959 is also included. The paper especially emphasizes the international amity and goodwill which have characterized the IGY in Antarctica. *Subject Headings:* **1. IGY Antarctic program 2. Antarctic IGY stations 3. Seismic ice-depth traverse data 4. Antarctica.**—*I.S.*

12.8–35 551.506.22:551.32

†International Geophysical Year, 1957/1958. IGY World Data Center A, Glaciology (American Geographical Society, N. Y.), **Glaciological Notes,** No. 1, Jan. **1960.** 20 p. Mimeo. Acquisitions of the Data Center Library, p. 3–19. **DWB** (Pam.)—An experimental series of mimeographed news type notes on glaciological activities throughout the world but especially in the U. S. to be issued quarterly. Extensive lists of articles and works in glaciology, meetings scheduled, positions available for glaciologists, etc. are included along with notes on the IGY data center for distribution at the American Geographic Society in N. Y. *Subject Headings:* **1. Glaciological activities 2. Glaciological newsletter 3. Glaciological bibliographies 4. IGY glaciological data centers.**—*M.R.*

12.8–36 551.506.22:551.521.12

Pivovarova, Z. I. and Pleshkova, T. T., **Aktinometricheskie nabliudeniia v SSSR po programme Mezhdunarodnogo geofizicheskogo goda.** [Actinometric observations in the U.S.S.R. for the program of the International Geophysical Year.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGO, Nekotorye problemy meteorologii,* No. 1:96–111, **1960.** 11 figs., 3 tables, chart. English summary p. 110. **DWB** (M(055) N418ne)—In this paper the list of stations operating on IGY programme with a brief description of their location is given. The equipment, the method of observations and the reduction of data are described. In addition there is given some information on radiational regime over the U.S.S.R. territory using the materials of 24 stations located southward of N 70° for the period of July–December 1957. The obtained values of summary diffusive radiation, of radiational balance of active surface and of albedo are given. These values are compared with the mean values of many years. *Subject Headings:* **1. Actinometric data 2. Antarctic IGY stations 3. Antarctica.** —*Authors' abstract.*

12.8–37 551.5:061.1

Hesselberg, Th., **Some remarks on international meteorology.** *World Meteorological Organization, WMO Bulletin,* 9(3):136–138, July **1960.** photo. **DWB**—In the last ten years WMO has steadily grown and diversified its activities. The network of synoptic stations has increased rapidly. It has been suggested that the observations from synoptic stations be used for international climatological work. Due to special conditions in the tropics, special data is required in the codes. *Subject Headings:* **1. International meteorology 2. Weather codes.**—*A.H.K.*

A7. ARCTIC—ANTARCTICA

See also: **Antarctica—a photographic survey** (Schulthess), 12.8–23; **IGY in Antarctica** (Law), 12.8–34; **Antarctic Symposium in Buenos Aires,** 12.8–56; **Snow drift and engineering design** (Gerdel), 12.8–104; **Arctic ionosphere and solar activity** (Gerson), 12.8–150; **Deformation of Ross Ice Shelf** (Zumberge et al.), 12.8–208; **Reports of Antarctic and N. Hemisphere glaciology program,** 12.8–216; **Wind transport of Antarctic snow** (Vickers), 12.8–347; **Antarctic snow stratigraphy** (Vickers), 12.8–370; **Late Pleistocene and recent limits of the Ross Ice Shelf, Antarctica** (Thomas), 12.8–378; **Determination of past Antarctic climate by thermoluminescence of rocks** (Zeller, Pearn), 12.8–379; **Some regularities in distribution of vegetation in Arctic tundra** (Aleksandrova), 12.8–386.

12.8–38 551.506.3(98)

Banks, H. C. and Partanen, E. N., **Meteorological observations.** *U. S. Air Force Cambridge Research Center, Geophysical Research Papers,* No. 63, Vol. 2, Dec. **1959.** pp. 1–15.

7 figs. Taken from a paper **Arctic weather, a report on T-3 observations in** *Alaskan Air Command Intelligence Review*, 35(1), Feb. 4, **1955. DWB, DLC**—The weather at T-3 was cold throughout this year, and exceptionally so during the long, dark winters. Summers were cloudy and foggy, whereas the winters and springs were relatively clear. Snow fell during every month, and rain and drizzle occurred frequently during the brief summer. Surface winds of gale force were seldom experienced. Most weather elements varied considerably from month to month, and noticeably between the two years *Subject Headings:* **1. Meteorological observations 2. Arctic Ice Island (T-3) 3. Arctic.**—*Authors' abstract.*

12.8–39 551.501.9:551.326.7(98)

Cottell, I. B. (*Geophysics Research Directorate, Cambridge, Mass.*), **United States research at drifting stations in the Arctic Ocean.** *Polar Record*, Cambridge, 10(66):269–274, Sept. **1960.** 18 refs. **DLC**—Three drifting research stations, "Alpha," "Bravo" and "Charlie" were maintained for various periods from 1952 to 1960. The histories of these stations and a brief outline of the work undertaken is given in this report. The meteorological program consisted of surface synoptic observations, upper air ascents and selected studies such as solar radiation, carbon dioxide, ozone and snow crystal studies. Heat budget studies were undertaken of the air-ice interface and the ice-ocean interface. Ice studies included tests of the tensile strength, the examination of ice cores and studies of the island structure and biology. Gravity, magnetic, oceanographic and submarine geophysical studies were also undertaken. The setting up of a further ice flow research station is under consideration. *Subject Headings:* **1. Arctic research 2. Drifting ice stations 3. Arctic Ocean.**—*R.B.*

12.5–40 551.506.7:551.521.18(988)

Fenn, Robert W. and Weickmann, Helmut K. (*both, USA Dev. Res. Lab., Ft. Monmouth, N. J.*), **Atmospheric net radiation flux during winter in the Thule area, Greenland.** *Journal of Geophysical Research*, Wash., D. C., 65(11):3651–3656, Nov. **1960.** 6 figs., ref., 16 eqs. **DWB, DLC**—A brief description of an airborne infrared net radiation receiver (developed in Germany) is given, and the results of radiosonde flights made with this element at Thule, Greenland, during Feb. 1959 are shown. The outgoing net radiation flux during the arctic winter increases with altitude from 0.05 cal cm^{-2} min^{-1} at the surface to about 0.2 cal cm^{-2} min^{-1} between 15,000 and 20,000 meters. Above 25,000 meters the outgoing net radiation flux again decreases considerably. *Subject Headings:* **1. Infrared radiation flux 2. Upper air data 3. Thule, Greenland.**—*Authors' abstract.*

12.8–41 551.524.4(98)

*Putnins, Pauls and Choate, M., **Distribution of temperature lapse rates over the Arctic Region.** U. S. Weather Bureau, Contract DA 3-99-00-500, Quarterly Report Feb. 1–April 30, 1960. July **1960.** p. 1–53. map, 2 figs., 8 tables, 6 refs. **DWB** (M(051) U587qu)—The distribution of temperature lapse rates over the Arctic region is described. The strong temperature and pressure changes observed over the Arctic indicate that horizontal and vertical movement is as pronounced as over the temperate zone. During the Soviet expedition of 1950–51, upper air observations were carried on for the months April through October. Temperature lapse rates are given for every ascent. The data obtained from Fletcher's Ice Island was used to compute mean lapse rates. Other stations in the United States and Germany were also used for the data. *Subject Headings:* **1. Vertical temperature gradient 2. Upper air observations 3. Arctic Ice Island (T-3) 4. Arctic.**—*A.H.K.*

12.8–42 551.501.9:551.326.7(98)

Sychev, K. A., **366 dneĭ dreifa na plavuchem ledianom ostrove.** [366 days adrift on a floating ice island.] *Problemy Arktiki*, No. 4:108, **1958. DLC**—Transl. into English by Sumner Kirshner and David Kraus issued by the American Meteorological Society under Contract AF 19(604)-1936, as its T-RC-16+, p. 12–13, Sept. **1959. DWB**—Drifting station NP-6 was set up at 74°24′N and 182°50′E. The station started operating on 19 April 1956. During the year, 3010 meteorological, 2090 actinometric and 292 astronomical observations

were made. Also, 720 radiosondes were released and 650 depth measurements were made. *Subject Headings:* **1. Ice islands 2. Drift ice station NP-6 3. Arctic Oceans.**—*A.H.K.*

12.8–43 551.324.8:778.35:519.24

Gonin, G. B., **Uchet torosistosti l'da po statisticheskoi obrabotke materialov aerofotos"emki.** [Determination of the hummocked ice distribution with statistical processing of the materials of the aerial photo surveying.] *Problemy Arktiki i Antarktiki*, Leningrad, No. 3:93–100, **1960.** 4 tables, 4 refs., 20 eqs. **DWB**—The ice cover in the Arctic, even in summer, is the basic factor for consideration of the climate and therefore, for weather forecasting. The presence of hummocked ice increases the average ice thickness up to 40%, which can be determined approximately by photo-sterioscopic analysis of the aerial photographs by consideration of the heights above the upper ice surface and the depths under water. The volume of the ice cover with hummocks can be computed with the Kirillov's equation with the factors (γ), corresponding to the volumetric form (conical) of the hummock above and under water, with the coefficient (η) of approximated form of the hummock (about 70%), hummock distribution factor (α) in % of total surveyed area (between 0 and 45%) and other physical factors. The character of the hummock distribution is analytically formulated with the Laplacian integral. The theory of probability and mathematical statistics are used for analysis of certain number (n) of hummock profiles with the Student and Gauss distributions and approximated dispersion. If, after solution of this problem by the first approximation, the computed error found is too high, the second approximation is used for a larger number (n) of profiles. Computation of mean value of the ice thickness and coefficient of correlation is described in detail and with tabulated values of the deviations and square of deviations between computed and mean values of thickness. The results of this computation are summarized in the conclusion. *Subject Headings:* **1. Aerial ice surveys 2. Ice hummock distribution 3. Arctic.**—*N.P.S.*

12.8–44 91.04(99) 551.506.22(73)

Siple, Paul Allman, **90° South: the story of the American South Pole conquest.** N. Y., Putnam, **1959.** 384 p. figs., photos. **DWB** (919.9 S618ni)—In this book Paul Siple, the scientific leader of the U. S. expedition tells in popular style the story of the first wintering at the South Pole during 1957. Ch. 26 summarizes the IGY scientific program carried out by the expedition at McMurdo Base. Numerous photographs, mostly in color, illustrate the book. *Subject Headings:* **1. U. S. IGY Antarctic expeditions 2. IGY Antarctic program 3. McMurdo Base, Antarctica.**—*I.S.*

12.8–45 91(99) 551.582.1(99)

Nauchnaia Konferentsiia po Problemam Meteorologii Antarktiki, Moscow, Oct. 26–28, 1959, **Tezisy dokladov.** [Summaries of reports.] Moscow, Gidrometeoizdat, **1959.** 48 p. **DWB** (M82.1/99 N289te) (Scientific conference on meteorological problems of the Antarctic)—Contains summaries of papers on a wide range of subjects, in four main categories: 1) general geography of the Antarctic; 2) the atmospheric circulation; 3) the radiation and heat balance, and special climatic problems, and 4) observational methods. The relief of eastern Antarctica and the thickness of the ice cover and the relief of the underlying strata, are discussed by Bugaev and Model', respectively. Circulation problems taken up include: cyclonic activity in the Indian Ocean sector of the Antarctic (Tauber), theory of the general circulation (Gusev), a comparison of Arctic and Antarctic circulation schemes (Gaigerov), synoptic processes in western Antarctica (Astapenko), the upper air temperature regime in relation to the circulation (Pogosian), and the regeneration of cyclones on Antarctic fronts (Shapaev). In the third group of papers, the following subjects are considered: radiation balance of the snowcover (Rusin), climatic zones of eastern Antarctica (Bugaev), katabatic winds (Tauber), the electrical field (Lobodin), etc. A series of new monthly pressure and temperature charts of the Southern Hemisphere, based on data for 1881–1940, was discussed by Batiaeva, but not enough information is given in the published summary to ascertain the significance of these charts in relation to other available series. *Subject Headings:* **1. Antarctic geography 2. Antarctic atmospheric circulation 3. Climate of Antarctica 4. Antarctica. I. U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby.**—*R. S. Quiroz.*

12.8–46 551.585:551.582.3(99)

Bugaev, V. A., **Klimaticheskie zony vostochnoĭ Antarktidy i iuzhnogo okeana.** [Climatic zones of eastern Antarctica and the southern oceans.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:3–10, March 1960. 3 figs. **DWB, DLC**—The five climatic zones: (1) high Antarctic platoon, (2) Antarctic slope, (3) Antarctic seacoast, (4) drifting ice and (5) open Antarctic water are described with maps and charts. The meteorological conditions of the first four zones are discussed in detail with respect to distribution and seasonal variation, snowcover and precipitation, intensity of wind storms, general severity, etc. The second zone is subdivided along the coastline into four additional climatic regions: (a) ice seacoast with the barrier, (b) external shelf-glaciers, (c) inner shelf-glaciers and (d) Antarctic oasis. The climatic characteristics of each region are described. The conditions of the fifth zone are outlined briefly. General locations of each zone are drawn on the first map and the topographic characteristics described in the text. The second map is marked with isolines of annual average temperatures, changing with latitude from −10°C for 66°N long. to −55°C at 84°N long. the coldest annual temperature −56° is located between 76° and 82°N long. The lowest daily temperature during August 1958 was observed at station "Vostok" and was −87.4°C. *Subject Headings:* **1. Climatic zones 2. Antarctica 3. Southern oceans.**—*N.P.S.*

12.8–47 551.508.79 511.556.4:551.578.46(99)

Garcia, R. (*Météorologie Nationale, Paris*), **Mesures du transport de neige par le vent à la station Charcot.** [Measurement of wind-drifted snow at Charcot Station.] *La Météorologie*, Paris, Ser. 4, No. 57:205–212, Jan./March 1960. 7 figs. French, English, Spanish and Russian summaries p. 205. **DWB**—Description of the device and technique employed in an attempt to determine the general balance of snow transport at the Charcot Station. The author describes the various improvements on the original apparatus which consisted of a tin fixed on a stake and having its opening facing the wind. The limited durations of measurement were fixed to 30 minutes by winds $\leq$10 m/s, to 15 minutes by winds $\leq$15 m/sec, and to 5 minutes by winds >15 m/s. The instruments are placed at 2.50 m, 1 m and 0.50 m above soil level on a duraluminium rod by means of swivelling supports adjustable in height. At 50 cm, for the year 1958, an average transport of 13.51 g/cm²/hour was recorded. In 1951, at Port-Martin an average transport of 24 g/cm²/hour for a mean wind speed of 17.9 m/sec. was observed. These results are comparable as in 1958 the mean wind speed at Charcot was 9.2 m/sec. *Subject Headings:* **1. Snow measurement instruments 2. Snow drift measurements 3. Charcot Station, Antarctica.**—*A.V.*

12.8–48 551.511.32:551.578.46:551.521.14(99)

Hanson, Kirby J. (*U. S. W. B.*), **Radiation studies on the south polar snowfield.** *American Geophysical Union, Transactions*, 41(1):75–81, March 1960. 6 figs., table. **DWB, DLC**—A report presenting preliminary results of the studies connected with the IGY radiation program at the South Pole Station. The radiation instruments used were Eppley normal-incidence pyrheliometer, Eppley horizontal-incidence pyrheliometer, and Beckman and Whitely total hemispherical radiometer and net exchange radiometer. The paper describes and graphically represents the radiation observations. Comparisons and relationships of radiation measurements are also presented. For the IGY period, the radiation loss at the South Pole is estimated at 35 ly/day, or less than half that estimated by Loewe for inland areas. *Subject Headings:* **1. IGY radiation program 2. Radiometers 3. Radiation measurement on snowfields.**—*I.S.*

12.8–49 535.242:551.593.55:551.510.53:551.594.12(99)

Weill, G., **Sur la répartition des ions N_2^+ dans la haute atmosphère antarctique.** [Distribution of N_2^+ ions in the upper Antarctic atmosphere.] *Annales de Géophysique*, Paris, 16(2):223–235, April/June 1960. 5 figs., 2 tables, 16 refs. French, English and Russian summaries p. 223. **DLC**—Study of a twilight effect in 3914 Å radiation, in Adélie Land, based on a set of photometric recordings obtained at the Dumont d'Urville Base during 1957. A short description of the instruments, the aspect of the recordings and a summary of the absolute gaging of the photometer are given. In the reduction of the observations, the atmos-

pheric diffusion and the stellar and atmospheric continuous background are taken into account. The author gives a clear account of the processing and interpretation of the photometric recordings. The photometric observation of paracrepuscular phenomena in 3914 Å radiation makes it possible to fix the order of magnitude of the average concentration of N_2^+ ions in the upper atmosphere. On an average, the N_2^+ concentrations were of about 2000 ions/cm³ at 200 km altitude, of about 450 at 300 km, of 90 at 500 km and of 28 ions/cm³ at 700 km altitude. *Subject Headings:* **1. Twilight radiation 2. Twilight spectra 3. Photometric observation techniques 4. Nitrogen ions in upper atmosphere 5. Dumont d'Urville, Antarctica.**—*A.V.*

12.8–50 551.506.22:551.515.81(99)

Astapenko, P. D., **Atmosfernye fronty v Zapadnoĭ Antarktike.** [Atmospheric fronts in western Antarctica.] *Meteorologiia i Gidrologiia*, Moscow, No. 9:24–29, Sept. **1959.** 2 figs. **DWB, DLC**—On the basis of synoptic data gathered during the IGY at Little America in the spring of 1958, the author demonstrates the existence of fronts in Antarctica owing to the absence of information on cloud-cover and to incomplete data on surface temperature it is difficult to analyze weather maps and to follow the evolution of atmospheric fronts. With the systematic analysis of temporal vertical sections of weather carried out daily at Little America on the basis of eight fixed observations at the surface of the earth and two radiosonde ascents, the existence of atmospheric fronts is demonstrated along the coast and on the continent in western Antarctica within the lower 1500 m. These fronts influence weather changes diversely. They can be followed by temporal vertical sections. Such a section for Little America for May 7–11, 1958 and a synoptic map for 0900 o'clock May 8, 1958 is presented. During May and June 34 atmospheric fronts were recorded at Little America; these included several fronts aloft and frontal occlusions which could not be followed at the surface but which were clearly manifested at 2–3 km altitude. *Subject Headings:* **1. Synoptic data 2. Frontal analysis 3. Little America, Antarctica.**—*I.L.D.*

12.8–51 551.506:551.582.2(99)

*Gusev, A. M. and Rusin, N. P., **Meteorologicheskaia kharakteristiki vnutrennego raĭona Vostochnoi Antarktidy po nabliudeniiam na stantsii Pionerskaia.** [The meteorological characteristics of the interior region of East Antarctica according to observations at Pioneerskaya station.] (In: Sovetskaia Antarkticheskaia Ekspeditsiia 1955–, **Klimat Antarktiki.** Moscow, **1959.** p. 102–109. 10 tables.) **DLC** (QC994.9.K6), **DWB** (M82.1/99 M886kL)—On the basis of the meteorological observations made at Pioneerskaia, the Soviet interior continental station in Antarctica, and those made along the route from Mirny to Pioneerskaia from May 1956 to Feb. 1957, the authors present the meteorological characteristics of the region of eastern Antarctica. Data are presented on the mean max. and min. monthly atmospheric pressure, mean max. and min. monthly air temperature at Pioneerskaia, mean decadal temperature at Pioneerskaia, mean max. and min. monthly atmospheric relative humidity, mean max. and min. monthly wind velocity, frequencies of wind with different velocities, distribution of wind velocities by direction, cloud cover, atmospheric visibility and number of days with various atmospheric phenomena (snow, fog, haze, snow storms etc.). *Subject Headings:* **1. Antarctic meteorological data 2. Marine climatic data 3. Pioneerskaya, East Antarctica.**—*I.L.D.*

12.8–52 551.506.5(269)

Khromov, S. P., **Pogoda ni nashem puti.** [The weather along our route.] (In: Sovetskaia Antarkticheskaia Ekspeditsiia 1955–, **Klimat Antarktiki.** Moscow, **1959.** p. 284–285.) **DLC** (QC994.9.K6), **DWB** (M82.1/99 M886kL)—The author describes the different kinds of weather encountered by the "Ob" during its passage through different climatic zones in the course of its voyage from Kaliningrad to Mirny in Antarctica and during the three months of travel in Antarctic waters between Antarctica and 60°S lat. (Jan.–March). About 25% of the time was characterized by storm weather. Twice the barometric pressure dropped to record lows of 953 and 956 mb. The wind never exceeded 25 and 30 m/sec. Also the weather encountered during the return trip is described. *Subject Headings:* **1. Antarctic climatic data 2. Marine meteorological data 3. "Ob" Expedition, 1955–56 4. Antarctica.**—*I.L.D.*

A8. CONFERENCES—SYMPOSIA

See also: **Symposium of Hannoversch-Münden, Sept. 1959** (IUGG), 12.8–2; **Colloquium at Astrophysical Inst., Paris, 1959,** 12.8–3; **Frontiers of numerical math** (Langer, *ed.*), 12.8–4; **Agromet. symposia,** 12.8–5; **Symposium held at Royal Obs., Uccle-Brussels, Oct. 1958,** 12.8–6; **Summaries of reports given at Conf. on Antarctic Met. Problems, Moscow, Oct. 1959,** 12.8–45; **Hydrological networks and methods seminar, Bangkok,** 12.8–202.

12.8–53 061.3:551.551.46:551.586:574

Pantin, C. F. A. (*Leader*), **A discussion on the biology of the southern cold temperature zone.** *Royal Society of London, Proceedings, Ser. B,* 152:429–677, 1960. figs., photos., refs.—This conference report is split into three sections; **Botany, Terrestial zoology** and **Marine biology.** Each section contains a number of papers read at the conference and general discussions. The discussions themselves contain contributions which may be as important as the opening papers. While the main theme is not meteorological, comment is frequently made of the climatological and oceanographical background. In particular one paper contained in the first section read by G. E. R. DEACON describes the oceanic circulation of the Southern Ocean and the climatic effects. One of the sections on the general discussion on botany is headed **Climate and vegetational history** and contains a notable contribution from H. H. LAMB raising queries on the past climates of the region. *Subject Headings:* **1. Southern cold temperate zone conferences 2. Biology 3. Paleoclimates 4. Oceanic circulation.**—*R.B.*

12.8–54 551.5:061.3(494)

Reichelderfer, F. W., **Third World Meteorological Conference.** *American Meteorological Society, Bulletin,* 40(11):588–589, Nov. 1959. **DWB, DLC**—During April 1959, the World Meteorological Organization held its third session in Geneva. WMO, which is a specialized agency of the U. N. has 102 member govts. It considered many important problems such as the use of artificial satellites, peaceful uses of atomic energy, etc. The WMO has also established a technical commission for hydrological meteorology. *Subject Headings:* **1. WMO activities 2. WMO conferences 3. Geneva, Switzerland.**—*A.H.K.*

12.8–55 551.521:061.3

Kondrat'ev, K. Ia., **Simpozium po radiatsii v Oksforde (Angliia).** [*Symposium on radiation at Oxford.*] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 4:630–631, April 1960. **DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—A report on the Radiation Symposium organized by the Committee on Radiation of the International Union of Meteorology and Atmospheric Physics held at Oxford during July 20–26, 1959. The principle theme of the Symposium was the study of radiation flux at different altitudes in the atmosphere, theoretical calculation of thermal radiation of the earth in cosmic space, outgoing short wave radiation for a Rayleigh atmosphere etc. The names of the Soviet participants are listed and brief summaries of the papers delivered are given. A number of papers dealt with methods of actinometric measurements, results of actinometric measurements carried out during the IGY, theoretical and experimental investigation of the transport of thermal radiation in the atmosphere etc. The symposium indicated that investigations on actinometry and atmosphere optics are more extensive and the level of investigation is higher in the U.S.S.R. than abroad. However, actual experimental and theoretical studies of radiation flux at different altitudes in the atmosphere need to be substantially expanded in the U.S.S.R. *Subject Headings:* **1. Radiation symposia 2. Radiation flux 3. Actinometric observation 4. Thermal radiation in the atmosphere 5. Atmospheric optics.**—*I.L.D.*

12.8–56 551.5(98,99):061.3

Antarctic Symposium in Buenos Aires. *World Meteorological Organization, WMO Bulletin,* (2):91–93, April 1960. **DWB**—In Nov. 1959, a Symposium was held in Buenos Aires to discuss the problems of Antarctica. Many excellent papers were read in the Symposium dealing with the problems of surface phenomena, general circulation, etc. One paper explained the variations in total ozone in Arctic region with month and latitude. The speakers

cautioned against comparing the conditions of Antarctic with those of Arctic due to the asymmetrical pattern of pressure and temperature fields in two regions. *Subject Headings:* **1. Antarctic symposia 2. Buenos Aires, Argentina.**—*A.H.K.*

A9. EDUCATION, HISTORY AND BIOGRAPHY

History

See also: **Development of hydrol., Russia** (Fedoseev), 12.8–13.

12.8–57 551.5:061.2(73)

Ludlum, David M. (*ed.*), **The American Meteorological Society 1944–59.** *Weatherwise*, Boston, 12(6):231–245, Dec. **1959.** 8 photos. **DWB**—History of the A.M.S. from 1944 to 1959, intended to be continuation of the late CHARLES F. BROOKS paper giving the earlier history of the Society. The continued expansion of the Society and its activities is traced in a descriptive and informative manner. The pertinent information is collected and described under the following headings: Reorganization, Membership, Meetings, Finances, Office of the Executive Secretary, Publications, Weatherwise, Publishing Services, Professional activities, Educational Services, the A.M.S. and the Public. Numerous pictures illustrate the paper. *Subject Headings:* **1. American Meteorological Society, 1944–1959 2. Meteorological societies 3. Charles F. Brooks.**—*I.S.*

12.8–58 551.576.12

Affronti, Filippo, **Le nubi: da Howard all'ultimo Atlante Internazionale.** [Clouds from Howard to the latest international atlas.] *Rivistia di Meteorologia Aeronautica*, Rome, 20(3):2013, July/Sept. **1960.** 5 figs. Italian, French, English and German summaries p. 3. **DLC**—The knowledge of clouds made little progress until a sure classification was available. This development started in the early XIXth century, and the first International Cloud Atlas, which was not published until 1896, marked a capital date. The present arrangement was long to be reached and some steady endeavour are recalled here. *Subject Headings:* **1. Cloud classification 2. International Cloud Atlas.**—*Author's abstract.*

12.8–59 551.582.2(52)

*Amano, R., **Historical weather from 1851 to 1883.** *Journal of Meteorological Research*, Tokyo, 11(11):151–156, **1959.** 5 tables. In Japanese. **DWB, DLC**—This is a climatic diary written by FUTENSAI (whose real name was KENKEN ICHIGAWA) during 1851–1883, when he was professor of the former Tokyo Imperial University. The observations of mean air temperature were recorded regularly and air pressure was recorded from time to time. The reason for the change from Sun calendar to Lunar calendar and from Fahrenheit to Celsius, is discussed and is partly compared with the results obtained from the data since the weather bureau was established in 1875. *Subject Headings:* **1. Historic weather records 2. Japan.**—*K.C.*

12.8–60 551.582.2(431.5)

*Lenke, Walter, **Klimadaten von 1621–1650 nach Beobachtungen des Landgrafen Hermann IV. von Hessen (Uranophilus Cyriandrus).** [Climatic data of 1621–1650 according to observations of Count Herman IV of Hesse (Uranophilus Cyriandrus).] *Germany. Deutscher Wetterdienst, Berichte*, 9(64), **1960.** 51 p. 7 tables, 18 refs. German and English summaries p. 3. **DWB, DLC**—The **Observationes** by the LANDGRAF HERMANN IV. VON HESSEN for 1635–1650 represent a single observational document from pre-instrumental times. They contain data of four hours of observation per day, particularly from Kassel and Rotenburg/Fulda. The meteorological observations of the journals have been evaluated statistically and extended to a 30 years period (1621–1650) by means of the two publications by the Landgraf: **Deutsche Astrologia** and **Historia Meteorologica.** The reliability of the material allows interesting comparisons with modern times. *Subject Headings:* **1. Climatic data 2. Historic weather records 3. Germany.**—*Author's abstract.*

Biography

12.8–61 551.57:92

Symons of Camden Town (Reprinted by permission of the Times). *Weather*, London, 14(1):24–25, Jan. **1959. DWB**—A biographical sketch of George James Symons, the founder of the British Rainfall Organization. His chief interest was in the moisture aspects of meteorology. In 1858, in the garden of his house in Camden Road, Symons first started the measurement and recording of rain. A description of his services, writings and recognition given to him, is included. *Subject Headings:* **1. Biography of George James Symons 2. British Rainfall Organization 3. Symons, George James.**—*I.S.*

12.8–62 551.5:92

Tenenbaum, Oscar, [**Obituary of**] **Ivan R. Tannehill.** *American Meteorological Society, Bulletin*, 40(8):431, Aug. **1959. DWB, DLC**—Dr. Ivan Ray Tannehill was born March 13, 1890 at McConnelsville, Ohio, and died at Frederick Md. May 2, 1959, age 69. He spent 40 years in U. S. W. B. (1914–1954). He received an honorary Doctor's degree at Denison University, Granville, Ohio. Tannehill was an excellent writer; among his best known books are **Hurricanes (1938,** 9th ed. **1956), Hurricane hunters** and **Drought** (1948). He was Chief of the Marine Div. (1930–40), Chief of Forecast Div. (1940–54) and Asst. Chief of U. S. W. B. (1954). He was active in IMO (Vice Pres. and Pres. of Comm. of Synoptic Weather Information, 1945–50) and delegate to meetings at Salzburg (1937), Berlin (1939), Montevideo (1939), Toronto (1947) and Washington (1947). He was a charter member of A.M.S. 1919–1954. *Subject Headings:* **1. Obituary of Ivan R. Tannehill 2. Tannehill, Ivan R.**—*M.R.*

12.8–63 551.5:92

Vuorela, Lauri A. (*Univ. Helsinki*), **Vilho Väisälä's 70th anniversary.** *Vaisala News*, Helsinki, No. 3:3–4, Oct. **1959.** Photo on cover. **DWB, DLC**—Vilho Väisälä's life and career are briefly reported. He was born Sept. 28, 1889 at Koutiolabti in eastern Finland. Following his graduation from the University of Helsinki in 1908 he began his career as an assistant at the Central Meteorological Office, Helsinki, where he continued to work until 1948. His numerous contributions, especially in the field of aerology, are mentioned. *Subject Headings:* **1. Biography of Vilho Väisälä 2. Väisälä, Vilho.**—*I.S.*

12.8–64 551.5:92

[**Biographical sketches of**] **Saradindu Basu and Dr. Andrew Thomson.** *World Meteorological Organization, WMO Bulletin*, 9(1):47–48, Jan. **1960.** 2 photos. **DWB, DLC**—Andrew Thomson, the Controller of the Meteorological Branch of the Canadian Department of Transport, retired on 25 Sept. 1959. Almost a month later, on 23 Oct. 1959, Saradindu Basu, F.N.I., the Director General of Observatories in India also retired. The former became the Controller in 1946 and has also played an active part in international meteorology. The latter had held his position since 1954. He represented India at many international meteorological conferences. *Subject Headings:* **1. Biography of Saradindu Basu 2. Biography of Andrew Thomson 3. Thomson, Andrew 4. Basu, Saradindu.**—*N.N.*

Bibliography

12.8–65 551.582:(016)(481)

*Creasi, Vincent J. (*Office of Climatology, U. S. W. B.*), **Selected bibliography on the climate of Norway.** Wash., D. C., U. S. Weather Bureau, Sept. **1960.** 55 p. 93 titles with annotations. Author and subject indexes, and an index by publication date are included. **DWB** (M(016)U587bno)—*Subject Headings.* **1. Bibliography on climate of Norway 2. Norway.**

12.8–66 551.48:016

*Deutsche Hydrographische Zeitschrift, Hamburg, **Hydrographische Bibliographie (Ozeanographie, Erdmagnetismus, Technische Physik, Nautik).** Reprint of this section from Vol. 12, No. 1–6, 1959, with original paging. **DWB, DLC**—This hydrographical bibliography is composed of reprints from 6 issues of *Deutsche Hydrographische Zeitschrift*, published during

1959. Each issue consists of over 300 items which are classified under the headings: Oceanography, Earth magnetism, Applied physics and Marine sciences. Bibliographical reference is given by the subject, the name of the author, as well as the title of the periodical. *Subject Heading:* **1. Hydrography bibliographies.**—*I.S.*

12.8–67 551.5:016

†Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Lindenberger Bibliographie.** [Lindenberg bibliography.] Its *Abhandlungen*, 8(56), **1960.** 72 p. **DWB, DLC**—The Lindenberg bibliography contains lists of publications of the collaborators and workers of the meteorological and hydrological services of the German Democratic Republic. The lists contain items published over a period of 50 years and are arranged or grouped according to authors names. Official publications of the Lindenberg Observatory are listed in the first section. The subjects vary widely within the fields of meteorology and hydrology. *Subject Headings:* **1. Meteorological bibliographies 2. East Germany.**—*E.Z.S.*

12.8–68 551:016

†Okko, Marjatta and Hannikainen, Marjetta, **Guide to the publications of the Geological Survey of Finland, 1879–1960.** Helsinki, Geologinen Tutkimuslaitos, **1960.** 104 p. Indexes by area, subject and author.—This guide to the publications of the Geological Survey of Finland contains references to materials and maps published since 1885. The survey publishes the Bulletin de la Commission Geologique de Finlande, Geoteknillesiojulkaisuja, Maps and Annual Reports—Vuosikertomukset. The development, contents, and coverage of the various serials are described at the beginning of each list. Author index, area index and a subject index are included. The guide is arranged for the use of the international reader. *Subject Headings:* **1. Geology bibliographies 2. Finland.**—*E.Z.S.*

A10. NEW SERIALS

See: **Glaciological Notes** (IGY), 12.8–35.

A11. SERVICES

See: **Awards for Weather Bureau cooperative observers** (Hagarty), 12.8–217.

A12. SOCIETIES

See: **American Met. Soc. 1944–59** (Ludlum), 12.8–57.

B. APPLICATIONS

B1. AERONAUTICS

See also: **Ice accretion and turbulence, N. Atlantic air routes** (Crossley), 12.8–337; **Structure of sea breeze front** (Wallington), 12.8–341.

12.8–69 551.551.5:551.557:629.13

Lominadze, V. P. and Napetvaridze, E. A., **Aerosinopticheskie usloviia turbulentnykh techeniĭ v atmosfere, vyzyvaiushchikh boltanku samoletov na trasse Sukhumi-Tbilisi-Erevan.** [Aerosynoptic conditions for turbulent currents in the atmosphere causing airplane bumpiness over the Sukhumi-Tiflis-Erevan route.] *Tiflis. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 4:112–123, **1959.** 7 figs., 2 tables, 2 refs. **DWB**—Four types of synoptic processes characterizing the atmospheric circulation over the Transcaucasus are described with the aid of synoptic maps and the intensity of airplane bumpiness associated with each synoptic type is discussed. These four types are as follows: Type I—processes of westerly incursion; Type II—processes of easterly incursion; Type III—anticyclonic condition

and Type IV—wave activity along fronts situated east of the Transcaucasus or somewhat to the south. The development of the synoptic process in each type, the role of the Caucasus Mountains in this development and the seasonal characteristics of the synoptic processes are described and the frequency and intensity of bumpiness associated with the different types of synoptic processes are discussed. Data are presented on the frequency of intense and moderate bumpiness as a function of synoptic processes during each of the seasons and on the frequency of bumpiness over parts of the air routes during the summer. *Subject Headings:* **1. Atmospheric turbulence 2. Bumpiness 3. Turbulence effects on airplanes 4. Sukhumi-Tiflis-Erevan air route 5. U.S.S.R.**—*I.L.D.*

12.8–70 551.511.6:551.551.5:629.13

Zavarina, M. V. and Iudin, M. I., **Utochnenie i ispol'zovanie chisla Richardsona dlia vyiavleniia zon boltanki samoletov.** [Elaboration and use of the Richardson number in detecting aircraft bumpiness zones.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:3–10, Feb. 1960. fig., 15 refs., 14 eqs. **DWB, DLC**—The authors developed a method of using the Richardson number for the forecasting of aircraft turbulence zones. This method was developed by means of airplane and radiosonde observations carried out during two year (in April) in the region of Minsk. It is pointed out that the use of R. is confined to a diagnosis of the turbulent state of the atmosphere. *Subject Headings:* **1. Richardson's number 2. Aircraft response to atmospheric turbulence.**—*A.M.P.*

12.8–71 551.594.221:629.135

Popov, Iu. A., **Razriad molnii na fiuzeliazh samoleta.** [Lightning discharge on the fuselage of an airplane.] *Priroda*, Moscow, No. 12:111–112, Dec. 1959. fig. **DLC**—The author describes a lightning discharge on the fuselage of an airplane which occurred on April 23, 1959, when the airplane was flying over the Irkutsk district. The airplane encountered suddenly a thunderstorm associated with the following meteorological conditions: cloud cover of 10 balls in two layers one of 400÷4000 m and the second 8000÷10,000 m visibility under the bottom cloud-5 km; wind at the surface of the earth northwesterly 8–10 m/sec. At 1400 m the airplane entered a dense cloud cover and the wings became covered with snow. At 18:40 o'clock lightning discharges to the earth occurred in front of the course of the airplane and the airplane was struck suddenly by the lightning. The aircraft darted suddenly but control was not lost. A fire ball slightly larger than a fist flashed on the left side and numerous fire sparks were scattered. The metal body of the cabin became strongly magnetized so that it introduced an error of 100° into the magnetic compass readings. The radio instruments were accurate but the radio compass also had a large error. *Subject Headings:* **1. Lightning strokes on airplanes 2. Irkutsk.**—*I.L.D.*

12.8–72 551.594.221:629.135

Gasser, Oswald, **Blitzschlag in ein Flugzeug am 6. Juli 1959 bei Markdorf/Bodensee.** [Lightning stroke on an aircraft on July 6, 1959 near Markdorf/Bodensee.] *Meteorologische Rundschau*, Berlin, 13(1):29, Jan./Feb. 1960. 2 figs. **DWB, DLC**—An aircraft flying from Echterdengen to Friedrichshafen was struck by lightning at 09:40 (G.M.T.), July 6, 1959. The aircraft flew between two thunderstorms at an altitude of 3350 ft asl (2000 ft above Friedrichshafen air field). The lightning struck when the aircraft flew outside the thunderstorm shower. The weather situation was characterized by numerous thunderstorms over southwest Germany which developed on the west of a low pressure trough extending from Scandinavia to northern Italy. The associated cold front by 0900 G.M.T. crossed the Bodensee and moved slowly eastward. The aircraft flew accidentally into the path of lightning which struck the outer edge of the left wing and caused a melt hole of 5–8 cm. From here the charge was distributed over the entire aircraft and as a result of metallic connections it was observed in the interior of the aircraft. *Subject Headings:* **1. Aeronautical meteorology 2. Lightning strokes on airplanes 3. Markdorf, Bavaria, Germany.**—*I.L.D.*

12.8–73 551.556.4:632.94

Yeo, D.; Åkesson, N. B. and Coutts, H. H. (*all, Colonial Pesticides Res. Unit, Arusha, Tanganyika*), **Drift of toxic chemicals released from a low-flying aircraft.** *Nature*, London,

183(4654):131–132, Jan. 10, 1959. 2 figs., 2 refs. **DLC**—A small high wing monoplane using dyed shell "Diesoline" for spraying, was flown 10 ft above the ground in open rolling grassland, and several long runs were made at right angles to the direction of the wind. The ground deposits recorded are graphically represented. The cumulative effect of successive swathes in the experimented area are discussed. The results indicate that the hazards are possible for distances of up to a mile or so downwind from a sprayed area. *Subject Headings:* **1. Downwind drift of toxic substances 2. Diesoline sprays.**—*I.S.*

B2. ASTRONAUTICS

See also: **Space flight** (Ehricke), 12.8–12; **Soft radiation measurements on Explorer VI** (Rosen et al.), 12.8–171; **Earth's shape** (O'Keefe et al.), 12.8–177.

12.8–74 551.507.362:629.19

Newell, Homer E. (*Natl. Aeronaut. & Space Admin., Wash., D. C.*), **Capabilities for space research.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1695–1712, Nov. 1959. 13 figs. **DLC**—A survey of the space research planning of the National Aeronautics and Space Administration. There is a description and illustration of present space vehicles and vehicles soon to be available, advance boosters under consideration, payload growth for different missions, the study of the atmosphere and ionosphere, study of energetic particles, of the great radiation belts, effects associated with magnetism, electricity and gravity. *Subject Heading:* **1. Space research and development.**—*E.K.* Ⓢ

12.8–75 551.507.362.2

Muller, P., **Les premiers lancers américains du programme spatial 1960.** [First American launchings of the space program 1960.] *L'Astronomie*, Paris, 74(5):225–227, May 1960, fig. **DLC, NNC, DWB**—The U. S. have just started the first part of its space program which had been exposed at the first international colloquy of the Committee on Space Research (COSPAR) held at Nice in January 1960. On March 11, 1960, was launched an interplanetary rocket intended to approach Venus' orbit. The author summarizes the performances of this launching and considerations are expressed on this subject. The launching on March 23 of Explorer VI, which was devised to study the outer Van Allen zones, was a failure. On April 1, the U. S. launched successfully another satellite, the Tiros, essentially equipped with two cameras for the transmission of pictures following a technique very similar to that of television. *Subject Headings:* **1. U. S. satellites 2. Satellite research.**—*A.V.* Ⓢ

12.8–76 551.507.362.2

Muller, P., **Des objets nouveaux dans le ciel: les satellites lancés par les hommes.** [New objects in the sky: satellites launched by man.] *L'Astronomie*, Paris, 74(5):201–205, May 1960.—The author enumerates and comments on the possibilities of investigating the upper atmosphere through satellites. Due to the variety of orbits from one satellite to another, the densities between 200 and about 700 km is known. The density variations according to season, the solar activity may be studied in a continuous manner. The motions of satellites supply informations on the shape of the Globe. Equipped with several radioelectric transmitters, the satellites enable the study of ionosphere and the borne instruments make possible the measurement of temperatures, pressures, intensities of the earth's magnetic field, radiations encountered, etc. The general outline of the motions of artificial satellites and the observational methods of spatial engines are summarized. *Subject Headings:* **1. Satellite observations 2. Satellite research.**—*A.V.* Ⓢ

12.8–77 551.507.362

Roman, Nancy G. (*Natl. Aeronaut. & Space Admin., Wash. 25, D. C.*), **Vehicles and plans.** *Astronomical Journal*, New Haven, Conn., 65(5):240–241, 1960. **DLC**—Vehicles and plans for space research beyond the terrestrial atmosphere are briefly surveyed. The new vehicles specifically designed for space research will be the Delta, the Scout, the Agena B, the Centaur, Saturn and Nova. These systems will provide successively larger payloads at increasing distances from the earth. The various space research programs mentioned in this paper are

Lunar Science Program, the National Aeronautics and Space Administration Solar Physics Program and the Observational Astronomy Program. *Subject Headings:* **1. Space research vehicles 2. Space research programs.**—*I.S.* Ⓢ

12.8–78 551.507.362.2:629.19

Assadourian, Arthur and Cheatham, Donald C. (*both, Langley Res. Center, Langley Field, Va*), **Longitudinal range control during the atmospheric phase of a manned satellite reentry.** *U. S. National Aeronautics and Space Administration, Technical Note* D-253, May **1960.** 46 p. 18 figs., table, 6 refs., eqs. **DWB, DLC**—The feasibility of guiding a manned satellite to some preselected destination, by making use of the pilot to control the trajectory, has been demonstrated. A fixed cockpit coupled with an analog computer simulated a high-drag variable-lift class of reentry vehicle. Two control methods were investigated, one making use of typical ground controlled approach procedures and the other making use of onboard navigational aids. Terminal range errors of the order of ±20 miles were possible for a wide range of conditions. *Subject Heading:* **1. Satellite re-entry.**—*Authors' abstract.* Ⓢ

12.8–79 551.507.362.2

May, B. R. and Smith, D. E. (*both, Radio Research Station, Slough*), **Final months and descent of satellite Sputnik 3.** *Nature*, London, 187 (4736):456–458, Aug. 6, 1960. 3 figs., table, 3 refs. **DWB, DLC**—Previous articles reviewed the satellites progress up to the end of April 1959. The mean nodal period-time curve from the beginning of May 1959 until its descent (April 6, 1960) is illustrated. It follows the generally expected shape. The orbital elements for the period June 1959 to April 1960 are tabulated. The period-time curve for the complete lifetime of the satellite is plotted. The shape of this curve is affected by the rotation of the orbit and this departure from a regular form has created difficulties in predicting the date of descent of the satellite. Other irregularities coincide with dates of geomagnetic storms. Little is known of the descent of the satellite as its suspected last transit lay mainly over the sea and unpopulated areas. *Subject Headings:* **1. Satellite orbits 2. Soviet satellite, 1958 Delta (Sputnik III).**—*R.B.* Ⓢ

12.8–80 551.507.362.2

May, B. R. and Smith, D. E. (*both, Radio Research Station, Slough*), **The sudden discontinuity in the orbital period of Sputnik 4 satellite.** *Nature*, London, 187 (4740):866–867, Sept. 3, 1960. **DWB, DLC**—Observations of the satellite at the Radio Research Station, Slough, indicate a discontinuity in the nodal period of the transmitting component. From Tass reports the "space capsule" was apparently intended to leave the orbit from near the perigee position by means of a retro-rocket system. The satellite was probably misaligned at the time of firing and as a result the capsule and the transmitting unit were placed into a higher orbit than that of the rocket. *Subject Headings:* **1. Satellite orbits 2. Soviet satellite, 1960 Epsilon I (Sputnik IV).**—*R.B.* Ⓢ

12.8–81 525.14:551.507.362.2

Message, P. J., **On Mr. King-Hele's theory of the effect of the earth's oblateness on the orbit of a close satellite.** *Royal Astronomical Society, London, Monthly Notices*, 121 (1):1–4, **1960.** 2 refs., 19 eqs. **DLC, DWB**—The relations are obtained between α and Ω, the parameters defining King-Hele's plane II, and the osculating inclination and longitude of node. The secular motion of the node is thereby obtained in terms of mean osculating elements in a form comparable to that arising in Brouwer's treatment of the canonical equations. A modification is made to King-Hele's theory which removes the singularities in the Je terms of $d\Omega/d\psi$, and it is also found that there are no terms of order Je^2 in α or Ω. *Subject Headings:* **1. Satellite orbits 2. Satellite gravity observations 3. Earth figure.**—*Author's abstract.* Ⓢ

12.8–82 535.24:551.507.362.2

Moore, James G. (*U. S. Naval Ordnance Test Station, China Lake, Calif.*), **Photometric observations of the second Soviet satellite (1957 β1).** *Astronomical Society of the Pacific, San Francisco, Publications*, 71 (419):163–165, April 1959. 2 figs., 2 refs. **DLC**—A brief report of the observations made at the U. S. Naval Ordnance Test Station, China Lake, Calif. of the

Soviet satellite 1957 β1 during a morning twilight passage on March 19, 1958. The details of the observational equipment are given. An oscillograph recording of the d.c. amplifier was made and the satellite was tracked across the sky with the photometer. Vega and Arcturus and their neighboring sky backgrounds were also scanned with the photometer to provide a calibration. The observational data are also graphically represented. *Subject Headings:* **1. Soviet satellite, 1957 Beta (Sputnik II) 2. Photometric observation of satellites.**—*I.S.* Ⓢ

B3. AGRICULTURE

See also: **Analysis and evaluation of established and expected agromet. conditions,** 12.8–5; **Potato blight epidemics** (Cox, Large), 12.8–27.

12.8–83 551.582.1(759) 63(058)

*Florida. Marketing Bureau, **Agricultural Statistical Summary, Vol. 43, 1959/1960. Acreage, production, value, disposition and transportation analysis with seasonal comparisons.** Pub. Nov. **1960.** 214 p. Almost entirely tables. **DWB** (388.17 F632ag)—Although this report summarizes data of special interest to agricultural studies, it contains a section which presents data of interest to meteorologists and climatology. Twenty-five year "monthly mean temperatures and rainfall are given for selected Florida cities. A narrative climatological summary of Florida accompanies the tabulated data. A map is included which shows the hurricane tracks of 1941 through 1959 and the major hurricane tracks from 1926–1940. *Subject Headings:* **1. Agricultural data 2. Climatic data 3. Agricultural statistical summaries 4. Climate of Florida 5. Florida. I. Scarborough, Elmo F.** (*ed.*)—*E.Z.S.*

12.8–84 551.586:551.526.6:551.524:633.491

Valle Espejo, Eugenio E., **Influencia de la temperatura superficial del mar sobre la temperatura ambiental de la costa central peruana (valle del Rimac) y sobre los endimientos de papa.** [Influence of surface temperature of the sea on the surrounding temperature of the central Peruvian coast and the potato harvest.] *Revista Meteorológica del Peru*, Lima, 5(9):4–9, June **1960.** fig., 3 tables, ref. **DWB**—A study was made on the influence of the sea (an area bounded by 77° and 78°W and 11° and 12°S) on the surrounding temperature in the central part of the Peruvian Rimac Valley (La Molina—25 km in a straight line from the sea) and its effects on the potato crop. Three charts are included: the 1st indicates average monthly surface temperatures at the edge of the ocean from 1936–1953; the 2nd, the average monthly sea water temperature from 1946–1952; the 3rd, the surrounding air temperature at the experimental station La Molina beginning Dec. 1932 through April 1953, except for Sept. and Oct. 1948 and Feb. 1953. An unnumbered table shows the output of potatoes in tons per hectare for intermittent years beginning in 1935 and ending in 1952. The information was that temperatures in May and June, high or low, indicated the relative temperature for the rest of the summer, high or low respectively, and, therefore, prognostication of the potato yield could be made up to 4 months before the harvest. *Subject Headings:* **1. Sea surface temperature influences 2. Potato crops 3. Peruvian coast.**—*A.L.M.*

12.8–85 633.15:631.547.1 551.586:581.14:633.15

de Vilmorin, Roger, **Expériences sur la germination des graines de maïs.** [Experiments on seed corn germination.] *Académie d'Agriculture de France, Paris, Comptes Rendus*, 46(3):102–104, Jan. 27, **1960. DLC, DA**—Statement of results of experiences made in studying the influence of soil moisture and soil temperature on seed corn germination. Temperature does not seem to play an important part, but moisture, on the contrary, seems to be determinant in the germination phase. An excess of water immediately after seed corn has been placed in the ground can endanger the spearing. The excess of moisture might provoke the phytotoxicity of treatment chemicals considered hitherto as not toxic, increase their inhibitory action on the development, act unfavorably on the tigelles and the roots. These two factors may combine their effects in the soil and be the cause of poor germination or account for backwardness in vegetation. *Subject Headings:* **1. Soil temperature effects on corn germination 2. Soil moisture effects on corn germination 3. Germination of seed corn.**—*A.V.*

12.8–86 551.586:551.579.5:633.15(472)

Kekukh, A. M. and Mikhailova, N. I., **Vlagoobespechennost' kukuruzy v usloviiakh ukrainskoĭ SSR.** [Moisture availability for maize under conditions of the Ukraine.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 16:54–62, **1959.** 5 figs., 2 tables, 4 refs., 3 eqs. **DWB** —Quantitative indicators of the water requirements of maize (total evaporation of plants and soil) during individual introphaze periods were determined and the relationship between moisture expenditure and agrometeorological conditions of natural geographic zones were established. The method of water balance involving observations of soil moisture content beneath maize plants were used. The closest relationship between the water requirement of maize and moisture supplies and precipitation during the growth period reduced by 0.6 is denoted by a correlation coefficient of 0.78. The water requirement of maize fluctuated between 200 and 400 mm and decreased from the Western part of the Forest Steppe to the Southern and Southeastern parts of the Central and Southern Steppe. In obtaining a harvest of 10–15 centiare per hectare the water requirement was about 260 mm. The soil moisture before sowing does not hinder germination in all the zones of the Ukraine. Germination depends upon air temperature and warming of the soil to 10–12°C. The coefficient of utilization of summer rainfall equal to 0.6, together with the spring moisture supplies reflect most accurately the relationship between yield and soil moisture. The hydrothermal index of SELIANINOV does not show a close relationship to the yield of maize since it does not take into account initial soil moisture and precipitation during the period when the temperature is below 10°C. The mean long period moisture supply of maize in relation to potential evaporation in percent is distributed over the Ukraine as follows: Northeastern part of the Forest Steppe—100%; left bank from 60% (Poltava) to 80% (Glukhov); the Northern and Central Steppe—40–50% and the Southern Steppe —30%. The equation for the dependence of total water requirement upon water supplies is $E=0.92\ (W+r)-28$ where E=total water requirement, W=supplies of productive moisture in the water layer of the soil and r=precipitation during the period. The relationship between yield and moisture supply is expressed by $B=0.00085\,(W+0.6r)-0.223\,(W+0.6r)+13.7$ where B=yield in centiare per hectare. *Subject Headings.* **1. Maize water requirements 2. Agrometeorological conditions for maize 3. Ukrainian, S.S.R.**—*Authors' abstract and I.L.D.*

12.8–87 551.586:633.1(448.6)

Soubies, L.; Gadet, R. and Maury, P., **Le climat de la région toulousaine et son influence sur les récoltes de blé et de maïs.** [The climate in the region of Toulouse and its influence on wheat and maize crops.] *Académie d'Agriculture de France, Paris, Comptes Rendus*, 46(4):185–195, Feb. 17, **1960.** 3 figs., 2 tables, 5 refs. **DLC, DA** —The study of the influence of climate in the region of Toulouse on wheat and maize yields, based on statistical omputation and regression equations. The statement of data and of working methods and considerations relating to the fluctuations and correlations between the climates of two successive seasons are given. The climate in this region presents a relative stability for the spring and summer seasons, especially as regards temperatures. A type of weather settled in March or April has more chances of being maintained until September than to change during the season. The pluviometry in September prefigures that of winter; a high amount of precipitation in October indicates a cool month of April; a rainy and mild month of November indicates cold and dry months of January and February; warm months of August and September indicate for the next year warm months of May and June. Regarding the influence of climate on the yields of wheat, the statistical calculation and the use of regression equations show that winter rain is the preponderant factor in determining the yield when its surplus or deficit character is sufficiently marked. The winter temperature also has an effect, but to a lesser degree. The September rains exert an influence on next year's crop. As for maize, the rains from June to September present a positive correlation with the yields. During these last years the climate in this region was unfavorable to wheat and maize yields. Recently, cultural progress and intensive use of nitrate fertilizers has counterbalanced for wheat the unfavorable influence of the climate. It is feared that cultural progress might not suppress this climatic influence on the maize, as during these last years the July rains kept a high correlation coefficient. *Subject Headings:* **1. Climate of Toulouse region, France 2. Climatic influence on wheat and maize yield 3. Climatic influences on crop yield 4. Toulouse, France.**—*A. V.*

B4. FORESTRY

See also: **Symposium on forest-water relationships** (IUGG), 12.8–2.

12.8–88 551.588.6 634.94(541)

Chatterjee, D. (*Supt. Indian Botanic Garden, Bot. Gard. P. O., Calcutta, India*) **Tropical vegetation of eastern India.** (In: UNESCO, **Study of tropical vegetation: proceedings of the Kandy Symposium, Kandy, Ceylon, March 1956.** Paris, UNESCO, **1958.** p. 61–67. 13 plates, map, bibliog. p. 67 (14 refs.). French summary p. 66.) **DWB**'(M86:580 U581st)—Records of the earliest visit by J. D. HOOKER to the Khasi Hills and the surrounding areas, over a hundred years ago, are reviewed and tied up with recent visits to the area and the botanical classification of the floral system of the vegetation belt in Assam. *Subject Headings:* **1. Tropical vegetation 2. Assam, India.**—*N.N.*

12.8–89 551.584.41:551.577.52(676.1/2)

Hopkins, B. (*University College, Ibadan, Nigeria*), **Rainfall interception by a tropical forest in Uganda.** *East African Agricultural Journal*, Kikuyu, Kenya, 25(4):255–258, April **1960.** 3 tables, 9 refs. **DLC**—This article begins with a short survey of the research conducted during recent years on the influence of forests on rainfall distribution and rainfall interception by forest canopy. The second part concerns an analysis of the observations made in Mpanga Research Forest, Uganda. The East African Virus Research Institute erected a 120 ft high tower in this forest in order to investigate the microclimate and insect movement. The forest canopy in the vicinity of the tower rises at about 30 m above ground level. A series of rain gages was installed, 4 of which are at soil level, and four series of 3 rain gages fixed on the tower at respective heights of 9.2 m, 18.3 m, 27.4 m and 36.6 m. Tables reproduce the observations made at the different rain-gages during the rainy season of March–May 1959. The differences in the main rainfall per observation period between Mpanga and the various heights on the tower were compared by *t* tests. The correlation coefficient was significant at all heights and very significant at 0 m and 36.6 m. The correlations between the Mpanga rainfall intensity and the rainfall recorded at the various heights on the tower were also calculated. Expressed in % the amounts of rainfall recorded at the different heights of the tower are: 66.4% at ground level, 104.4% at 9.2 m, 99.1% at 18.3 m and 111.2% at 36.6 m top of the tower. The results show that about 35% of the rain falling on the forest is intercepted before it reaches the ground and almost all of this interception takes place between ground level and 9.2 m height. The interception is caused by the herb layer. The results also suggest that there is a negative correlation between interception and rainfall intensity. *Subject Headings:* **1. Forest microclimatology 2. Precipitation interception 3. Uganda, Kenya.**—*A.V.*

B5. MEDICINE AND HEALTH

See also: **Days with free föhn and their biological significance** (Umdt), 12.8–345.

12.8–90 551.511.6:551.510.42:614

†Hašek, Milan, **Některé problémy aplikace teorií atmosférické difuse v hygiene.** [Some problems in the application of the atmospheric diffusion theory to public health.] *Meteorologické Zprávy*, Prague, 12(4):82–87, **1959.** table, 38 refs., 25 eqs. Czech, Russian, German and English summaries p. 82. **DWB, DLC**—General problems of the spreading of various substances in the atmosphere are presented and systematic classification of their various sources is carried on, from the standpoint of physico-mathematical solution. Some theories and methods of calculating the spreading of pollutants exhalled from chimneys or other continual point sources are concisely described. The Sutton theory and its analysis is presented more completely; the author makes a proposal of a new way of measuring and calculating its turbulent parameters and an outline of a modification of this theory for a broken up country-site. The procedure of practical calculations of concentrations of polutants for sanitary purposes is presented. The paper calls attention to the mistakes that could occur without measuring meteorological parameters. *Subject Headings:* **1. Atmospheric diffusion theory 2. Public health.**—*Author's abstract.*

12.8–91 551.586:616.988.23

Landers, Holbrook (*Dept. of Met., Florida State Univ., Tallahassee*), **Weather aspects of Tallahassee polio-like outbreak.** *Florida Medical Association, Journal*, 43:355–359, Oct. 1959. 6 figs., 4 refs. Abstracted from reprint. **DWB** (M86.616 L255we) The Leon County Health Unit indicated 388 cases of polioencephalitis had occurred in this county out of a total of 451 most serious cases in the state. Most of these occurred in September and October, 1954. Oct. 1 had the highest record. The curves of meteorological variables and PE curves were compared and there is great similarity. The average time lag agrees with the average incubation period of the polio-like outbreak. *Subject Headings:* **1. Polio-like outbreak 2. Weather influences on Polio.**—*N.N.*

12.8–92 551.586:615.834 551.586:616.5

Linser, Karl (*Universitäts-Hautklinik der Charite, Berlin*), **Die Klimatherapie bei Hautkrankheiten.** [Climatic therapy for skin diseases.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):110–116, Jan./June 1959. German and English summaries p. 110. **DWB, DLC**—The author mentions those dermatoses which are to be cured preferably by climatic treatment. As to climatic treatment high mountains are more suitable than the Mittelgebirge (i.e., the Central German mountain ranges). Climatic contrasts are recommended. Humidity and heat factors are important. The statements made by the patient and his reaction to climate are to be taken into consideration. During a climatic cure the therapia externa, which is detrimental to the psychic condition, should not be applied. Air pollution is well apt to endanger the success of the treatment applied. Prior to the beginning of a cure a thorough medical examination of the patient should be made. A detailed discussion on the measures taken by the hospital in the particularly favorable high mountain climate (Obergurgl) and in the sea-side climate (Kap Arkona) follows. Patients suffering from atopic dermatitis will, before being sent to the high mountains or sea-side, possibly have to undergo the Prednison therapy, which might cause a complete disappearence of the visible symptoms. By application of the Prednison therapy the unpleasant post-cure relapses might be prevented or at least delayed. Climatic therapy is rather intended to support the conventional methods of treatment than to be looked upon as a miraculous cure. *Subject Headings:* **1. Climatic therapy 2. Skin diseases.**—*Author's abstract.*

12.8–93 551.586:615.838

Lühr, Karl (*Friedrichstadt-Krankenhaus, Dresden*), **Objektivierung and Objektivierbarkeit des Kurerfolges.** [Criteria for an objective evaluation of the results of a health resort treatment.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):82–87, Jan./June 1959. **DWB, DLC**—The results of scientific teamwork, in cooperation with the bioclimatic research station of the Meteorological Service of DDR at Bad Elster, are presented. The establishment of a local balneological research institute is suggested. Various experimental results are described, showing the importance of objectivity for the improvement of balneological therapy. *Subject Headings:* **1. Bioclimatological research 2. Health resort treatment 3. Balneological therapy.**—*O.T.*

12.8–94 551.586:616.853

Pastrňák, Miloslav, **Epileptické záchvaty a počasí.** [Epileptic fits and weather.] *Meteorologické Zprávy*, Prague, 12(1):7–15, 1959. 2 figs., 5 tables, eq. Czech, Russian and German summaries p. 7–8. **DWB, SLC**—An analysis of meteorological elements in connection with epileptic fits shows that absolute values of relative humidity, vapor pressure, temperature and barometric pressure have little influence on epileptic fits. Only relative values of barometric pressure have certain connection with epileptic fits. These are more frequent with medium values than with high values. *Subject Headings:* **1. Weather influences on epilepsy 2. Epilepsy.**—*J. Němec.*

12.8–95 551.586:615.834 551.586:613.15

Seifert, Karl, **Staatliche Massnahmen zum Schutze des Klimas in Kurorten.** [State measures for the preservation of health resort climates.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):75–77, Jan./June 1959. **DWB, DLC**—Various provisions of the Health Resort

Ordinance (KOO) of the DDR for the improvement of the bioclimatic features of health resorts are elaborated. Further steps, by cooperation public organizations, among them of the meteorological stations, are suggested. *Subject Headings:* **1. Health resort ordinances 2. East Germany.**—*O.T.*

12.8–96 551.586:615.834 551.586:616.24

Zenker, Helmut (*Bioklimatische Forschungsstation, Bad Berka*), **Die Bedeutung des Lokalklimas für Kuranlagen—am Beispiel einer Tuberkulose-Heilstätte.** [The importance of local climate for resorts, taking a health resort for tuberculosis as an example.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):11–14, Jan./June 1959. 3 figs. German and English summaries p. 11. **DWB, DLC**—Using diurnal and annual variations of some meteorological elements as they occur in a valley and at the tuberculosis hospital in Bad Berka, in an open-air resting hall, and in a sick room of this hospital, the different local or health resort climates respectively are shown. Their importance to human organism is discussed. The predominantly unfavorable bioclimatological conditions of health resorts situated in a valley are indicated and compared with places at a higher elevation. In particular, the importance of the open-air resting hall climate to the treatment of pulmonary tuberculosis is pronounced. *Subject Headings:* **1. Health resorts 2. Bioclimatology 3. Local climatic studies 4. Bad Berka, Germany.**—*Author's abstract.*

B6. RADIOACTIVITY

See also: **Radiation dosage and effects** (Rajewsky et al.), **12.8–19.**

12.8–97 551.510.721(410)

Anderson, W.; Bentley, R. E.; Burton, L. K. et al. (*all, Physics Dept., Inst. of Cancer Res., Royal Cancer Hospital, London*), **Radioactive fallout during 1959.** *Nature*, London, 186(4729): 925–928, June 18, 1960. fig., 4 tables, 11 refs. **DWB**—The results of investigations on the fallout for the period of suspension of nuclear weapons between Nov. 1958 Feb. 1960, based upon measurements, especially of the radiostrontium content of rain water samples during 1959 over Great Britain. Also, the variations in the concentration of certain short-lived fission products present in surface air during the same period, are discussed. The deposition contribution of about 20% for both May and June with comparatively low rainfall compared with about 5% for the other months indicate that the rapid fall is due to meteorological factors. 70–85% of the strontium-90 deposited during May-August 1959 was derived from fission processes of the autumn of 1958. The results for the concentration of rhodium-106 in surface air showed the decrease of the specific nuclear dust content of the air exponentially, the "half-life" of this process being approximately 22 days. The values plotted for rhodium-106, showing a close similarity to the figure above, indicated no substantial additions of relatively short-lived fission products to the lower atmosphere during June–Sept. 1959. The trend of the values of strontium-90 plotted for May–August 1959 indicated that at the end of 1959 strontium-90 levels were being maintained by material from a stratospheric reservoir only. The question of the average age of strontium-90 in the stratospheric reservoir indicated the origin of large proportions of the fallout at the end of 1959 in fission processes which occurred during 1958. The trend of regular seasonal fluctuations in the concentration of strontium-90 in rain over Great Britain during 1955–58 is probably due to a rapid descent of activity in the spring from tests conducted at high latitudes in the autumn of the preceding year, and to a steady leak from a relatively persistent stratospheric reservoir. The higher strontium-90 maximum in 1959 might be due to the superimposition of another upward fluctuation of older stratospheric material. *Subject Headings:* **1. Radioactive fallout data 2. Strontium^{90} fallout 3. Meteorological effects on radioactivity 4. Great Britain. I. Crookall, J. O. II. Greatorex, C. A.**—*O.T.*

12.8–98 551.510.721:662.2:539.1(481)

Hvinden, T.; Hveding, D.; Lillegraven, A., et al. (*all, Norwegian Defence Res. Estab. Kjeller*), **Fall-out over Norway from high-yield nuclear explosions.** *Nature*, London, 185(4716):805–807, March 19, 1960. 3 figs. **DWB**—Fall-out materials which rise well into the stratosphere after high yield test explosions begin to reach the lower stratosphere over

southeast Norway shortly afterwards. It now seems that deposition is a fairly continuous short term process lasting months instead of years, and affecting very large areas. In view of the short deposition times, measurements of external radiation levels and gross activity measurements now have an increased importance in relation to measurements of selected long lived isotopes, in assessing possible radiation hazards. *Subject Headings.* **1. Radiation hazard assesments 2. Radioactive fallout distribution 3. Norway.**—*E.Z.S.*

12.8–99 551.510.7(52)

Lockhart, Luther B., Jr. (*U. S. Naval Res. Lab., Wash., D. C.*), **Atmospheric radioactivity levels at Yokosuka, Japan, 1954–1958.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1445–1449, Oct. 1959. 2 figs., 4 tables, 6 refs. **DLC**—For the past ten years the U. S. Naval Research Laboratory has had under way a program relating to the radioactivity of the atmosphere. This has involved the study of both natural and man-made radioactive materials in the air and their distribution, transport, and removal from the atmosphere. This report summarizes measurements made on the concentrations of some natural radioactive materials and of gross fission products in the air at ground level at Yokosuka, Japan, during 1954–1958. These data support the conclusions that the concentrations of both natural radioactive products and fission products in the air at ground level vary widely from time to time, that the change in the concentration of the natural radioactivity is related in a general way to the phenomena that control precipitation, and that the trend of the fission-product concentration has been upward during the past few years as a result of increasing nuclear testing. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Yokosuka, Japan.**—*Author's abstract.*

12.8–100 551.510.72:551.510.721:551.577.7

Marquardt, W., **Ergebnisse der Radioaktivitätsmessungen in Dresden-Wahnsdorf.** [Measurements of radioactivity in Dresden-Wahnsdorf.] *Zeitschrift für Meteorologie*, Berlin, 13(9/10):237–248, Sept./Oct. 1959. 12 figs., table, 10 refs. German and English summaries p. 237–238. **DWB, DLC**—At the Dresden-Wahnsdorf Observatory β-radiation of the radioactive aerosol of the atmosphere has been watched continuously since Nov. 1956. The operating device and calibrating procedure are described. Results, which are of major importance, of radioactivity measurements are studied, the annual variation and unusually significant distribution as a function of the wind pattern being particularly emphasized. The results of measurements of man-made radioactivity indicate a distinct increase. Autoradiographs of filters are discussed. Effort is made to establish a relation between the extent of spots and the intensity of radiation, and to find evidence of the approximate frequency of particles of selected intensity. Furthermore, various methods for evaluating the total radioactive fallout are discussed. A report is submitted on radioactivity of precip. water and dry sedimentation. Finally, attention is drawn to measurements of rime and fog water at the stations in Geisingberg and Kap Arkona, and to an instructive investigation of snow water. *Subject Headings:* **1. Radioactivity monitoring 2. Autoradiographs 3. Radioactive fallout measurement techniques 4. Radioactive-hydrometeors.**—*Author's abstract.*

12.8–101 551.510.72 551.577.7

Kopcewicz, Teodor; Tomaszenko, Roman and Tomczak, Jan (*all, Inst. Hydrol. Meteor d'État*), **La radioactivité des aérosols, des précipitations, de l'eau de la Vistule et de la mer observée par les stations de l'Institut Hydrologique et Météorologique d'État en 1958.** [Radioactivity of aerosols of precipitation and of the water of the Vistula and of the sea, observed by the stations of the State Hydrological and Meteorological Institute in 1958.] *Acta Geophysica Polonica*, Warsaw, 7(2):103–129, 1959. 10 figs. (1 fold), 10 tables, 3 refs., 3 eqs. Polish summary p. 129. **DWB, DLC**—The apparatus, the methods for measuring, and the numerical results of the measurements of the radioactive aerosols in the air, precipitation at Legionowo and Gdynia, as well as of the water of the Vistula and of the surface water of the Baltic Sea are described. The dates of nuclear explosions on the basis of the decrease of the intensity of radioactivity, from the samples taken from the air and the precipitation are calculated. The paper is extensively illustrated by tables and graphical representations. *Subject Headings:* **1. Radioactivity measurements of precipitation 2. Aerosol radioactivity 3. Sea water radioactivity 4. River water radioactivity 5. Poland 6. Baltic Sea.**—*I.S.*

B7. INDUSTRY

12.8–102 551.556.6:624.97

†Cohen, Edward (*Ammann & Whitney, N. Y. C.*), **Wind load on towers.** *Meteorological Monographs*, Boston, 4(22):25–42, May **1960.** 29 figs., 50 refs., 16 eqs. **DWB, DLC**—The two basic types of towers are briefly described with their diversity in form, construction, and function illustrated by a number of recently constructed structures. The general theory of wind pressure for aerostatic effects and the empirical-shape factors reported for common structural members are presented. Composite shape factor-solidity ratio relations for square and triangular towers are derived through the use of test data on trusses for aerostatic drag, shielding, and yaw effects. The validity of these relations as reasonably conservative design tools is confirmed by a comparison with test results. Various foreign and American codes are compared relative to aerostatic wind-loading recommendations on tower structures. Vibration of towers in the direction of the wind and the dynamic behavior of cylindrical elements normal to the wind stream are examined. Recently reported test data on aerodynamic-lift (lateral force) coefficients are presented, and recommendations are made for the dynamic design of cylindrical tower structures. The types of guy oscillation due to wind action and possible means of their suppression are indicated. Design loadings as well as design procedures for determining maximum stresses and deflections are discussed. The safety of tower structures is discussed, and the additional data required for an accurate estimate of safety are described. *Subject Headings:* **1. Wind effects on buildings 2. Wind load on structures 3. Aerodynamic-lift coefficients.**—*Author's abstract.*

12.8–103 551.551:551.556.6:69

†Cramer, H. E. (*Mass. Inst. of Tech.*), **Use of power spectra and scales of turbulence in estimating wind loads.** *Meteorological Monographs*, Boston, 4(22):12–18, May **1960.** 5 figs., table, 29 refs., numerous eqs. **DWB, DLC**—Estimates of wind forces on structures are traditionally based on the assumption that the wind speed is invariant with space and time. However, air flow within the lower layers of the atmosphere is almost always turbulent due to fluctuations in wind velocity that comprise a very broad spectrum of characteristic lengths and amplitudes. In view of the fundamental dynamic nature of the problem, ultimate resolution depends upon satisfactory knowledge of the spectra and cospectra of the wind-velocity fluctuations. Recent measurements of these properties of turbulent structure are summarized, and application of these data to the problem of estimating wind forces is discussed. It is suggested that estimates of maximum wind speeds associated with gusts may be conveniently based on the level of the mean wind speed, assuming that the fluctuations in wind speed are approximately Gaussian and that the average turbulent intensity is about 0.25. Until additional measurements of the basic properties of turbulent structure are available, it appears unlikely that the power-spectral-analysis techniques can replace the conventional steady-state procedure. *Subject Headings:* **1. Wind load on structures 2. Wind velocity fluctuations 3. Wind power-spectral analysis techniques.**—*Author's abstract.*

12.8–104 551.578.466:62(98)

Gerdel, R. W. (*U. S. Snow Ice and Permafrost Research Establishment*), **Snow drifting and engineering design.** *Meteorological Monographs*, Boston, 4(22):57–64, May **1960.** 9 figs., 6 refs. **DWB, DLC**—The results of field experiments and observations on drift snow accumulation in the vicinity of Arctic bases show that it is possible to design buildings and facilities and to lay out bases and depots in Polar regions which will largely control drifting snow. It is possible, also, to make use of drifting snow in the construction of some facilities. Design criteria for Arctic construction, which will reduce snow drifting to a minimum include the following: (1) elevation of buildings above the ground surface to permit free flow of wind-borne snow beneath the structure, (2) orientation of buildings and base layout to minimize coalescence of drifts, and (3) elevation of roadways and air strips to provide self clearing of the traffic surface. Drifting snow may be accumulated by suitable catchment fences and utilized to construct elevated roads, air strips, and hardstands on the Polar Ice Caps, where loss of seasonal precipitation by melting is negligible. Efforts are being made to develop snow-simulating materials suitable for scale-model tests in a wind tunnel. It appears that there must be a scaled relationship between the physical properties of the simulator and the prototype snow.

Subject Headings: **1. Snow drift control 2. Arctic construction criteria 3. Engineering design for drifting snow 4. Arctic.**—*Author's abstract.*

12.8–105 551.501.774:551.574.42:621.315

Rudneva, A. V., **K voprosu ob ispol'zovanii dannykh nabliudenii na gololednykh stankakh dlia rascheta nagruzok na liniiakh sviazi i elektroperedach.** [The use of data obtained from glaze collectors in calculating loads on communication and power lines.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 75:32–77, **1957.** 12 figs., table, 2 refs. Appendix (tables) p. 41–77. **DLC**—The principle part of the standard glaze mounting in a wire 5 mm in diameter one meter long situated in a meridional and latitudinal direction 1.9 and 2.2 m above the ground. The amount of ice deposited on the wire is determined by two mutually perpendicular measurements: along the large diameter (D) and small diameter (d) or thickness (T) of the deposit at a given place. The large diameter is along the line of maximum deposition of ice including also the thickness of the deposit, is determined in the direction perpendicular to the diameter of the deposit at that point where the deposit is a maximum. The analysis of instrumental observations on glaze has shown the magnitude of the large and small diameter of ice deposition on wires differ and the cross section of deposition usually has the shape of an irregular ellipse. An analysis of graphs showing the relationship between the large diameter and thickness of glaze and rime deposition on wires in climatically different areas shows that in the beginning of the icing process the magnitude of the diameter and thickness do not differ when the wire has a diameter of 5 mm. The differences become more perceptible when the diameter of the wire exceeds 10 mm. Hence in computing glaze loads on wires, recording of the large diameter in the absence of data on weight overestimates the load and recording of the small diameter alone underestimates the weight. The cross section area of glaze time deposits can be determined with sufficient accuracy from formulas for an ellipse on the assumption that the maximum and minimum dimension are equal to its large and small diameter (taking into account the cross section of the wire itself). In order to reduce the data on ice deposits on wires obtained at weather stations to cylindrical deposits of equal size the formula prepared by engineers is recommended, namely:

$$c = \sqrt{\frac{Dd-2r}{2}}$$

where D = large diameter of the deposit, d = small diameter, $2r$ = diameter of wire (5 mm), c = thickness of the layer of the deposit in millimeters around the wire necessary for computing the load. *Subject Headings:* **1. Glaze loads on communication and power lines 2. Glaze measurement techniques.**—*I.L.D.*

12.8–106 551.556.3:621.311.24

*Fukuoka District, Japan. Central Meteorological Observatory, **Meteorological study of large-scale generation of electricity by wind power, Pt. 2.** *Japan. Meteorological Agency, Tokyo, Memoirs of Industrial Meteorology*, 19(2):117–147, March **1956.** 45 figs., 25 tables, 16 refs. In Japanese; English summary p. 146–147. **DWB, DLC**—The main problems concerned with the building of wind-mill are as follows: maximum wind speed and its altitude, fixed windmill and wind direction, wind direction and speed in the free atmosphere, topographical effect on acceleration of wind speed, changes of wind direction and speed due to mountain ranges, altitude and speed of the air over the mountain, available amount of wind power, and meteorological elements concerning the utilization of wind power. Each problem was discussed with a detailed analysis and illustrations; discussion on gustiness was as follows: The magnitude of gustiness g is:

$$V = \frac{M+m}{2} \qquad a = \frac{M-m}{2} \qquad g = \frac{a}{v} = \frac{M-m}{M+m}$$

where M = maximum wind speed in the ten-minute period preceding every hour of the clock, m = minimum wind speed in the same period, V = wind speed (Figs. 36, 37, 38, 39). Then it has discussed the characteristics of gustiness and classified four types of air stream: external and internal frictional eddy type and convectional and laminar flow type. *Subject Headings:* **1. Wind power utilization 2. Windmills.**—*K.C.*

12.8–107 551.501.75:621.311.24

Golding, E. W., **Memorandum on the measurement of wind velocity and power.** (In: National Research Council of Canada, (comp.), **Technical papers presented to the Wind Power Working Party (of the O.E.E.C.).** London, H. M. Stationery Office, [1954?] p. 195–205. 6 figs., eqs.) **DWB**—The first section develops the energy pattern factor; the second points out the quantities to be measured and presents two methods of measurement. The relative merits of the methods, (a) energy estimation from mean hourly wind speeds; (b) integrated actual energy, are discussed. Another section deals with extraction of wind energy by an aerogenerator. *Subject Headings:* **1. Wind measurement techniques 2. Wind power calculations.**—*E.Z.S.*

12.8–108 551.5:625.1

Wintle, B. J. (*British Transport Commission*), **Railways versus the weather.** *Weather*, London, 15(4):137–139, April **1960. DWB**—A brief discussion of weather hazards in England which pose problems for the operation of railways. Fog, snow and ice are the chief winter hazards, while floods and gales may cause dislocation of railway services at any time of the year. The devices employed to counter these hazards are described. Also, the important part played by regular weather forecasters in controlling the weather effects are mentioned. *Subject Headings:* **1. Weather hazards 2. Weather effects on railways 3. England.**—*I.S.*

B8. RADIO COMMUNICATION

See also: **Radioastronomy** (Section C8).

12.8–109 551.510.62:621.396.1:551.594.52

Agy, Vaughn, **A study of auroral zone attenuation of high frequency radio waves.** *U. S. National Bureau of Standards, NBS Report*, 6082, Nov. 23, **1959.** 18 p. 25 figs., 2 tables, 3 refs. **DWB**—The experiment reported was for the precise determination of the difference in field strength at College and Anchorage, Alaska, of C. W. radio waves received from Bismarck, N. D. This final report presents systematic description of the experiment. First the experimental set-up and early inferences are described. Then, comparison of the two data are made by listing similarities and differences. Finally, the report discusses the conclusions. Numerous graphical representations illustrating the study, are put together at the end. *Subject Headings:* **1. Radio wave attenuation 2. Auroral effects on radio propagation.**—*I.S.* Ⓢ

12.8–110 551.510.62:621.396.1

†Wait, James R., **Mode theory and the propagation of ELF radio waves.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(4):387–404, July/Aug. **1960.** 10 figs., 48 refs., 50 eqs. **DWB, DLC**—The mode theory of propagation of electromagnetic waves at extremely low frequencies (*ELF*) (1.0 to 3000 cycles per second) is treated in this paper. Starting with the representation of the field as a sum of modes, approximate formulas are presented for the attenuation and phase constants. Certain alternate representations of the individual modes are mentioned. These are used as a basis for describing the physical behavior of the field at large distances from the source, particularly near the antipode of the source. At the shorter distances, where the range is comparable to the wave length, the spherical-earth mode series is best transformed to a series involving cylindrical wave functions. This latter form is used to evaluate the near field behavior of the various field components. The effect of the earth's magnetic field is also evaluated using a quasi-longitudinal approximation. In general it is indicated that if the gyrofrequency is less than the effective value of the collision frequency, the presence of the earth's magnetic field may be neglected for *ELF*. When this condition is not met the attenuation may be increased somewhat. The influence of an inhomogeneous ionosphere is also briefly considered and finally, the propagation of *ELF* pulses is treated. It is suggested that certain observed characteristics of *ELF* waveforms may be attributed to the inclination of the current channel in the lightning discharge. *Subject Headings:* **1. ELF radio waves 2. Earth's magnetic field effects on radio waves 3. Radio wave propagation.**—*Author's abstract.* Ⓢ

12.8–111 551.510.62:551.510.52:06.045(73)

†National Research Council, Wash., D. C. U. S. National Committee on the International Scientific Radio Union, **Report of U. S. Commission 2 on Tropospheric Radio Propagation, to the 13th General Assembly of the ISRU, London, Sept. 5–15, 1960.** *U. S. National Bureau of Standards, Journal of Research, Section D*, 64(6):607–627, Nov./Dec. 1960. Bibliog. of papers published since the 12th General Assembly, p. 622–627. **DWB, DLC**—This report contains a brief summary of the work of the U. S. National Committee of Commission II on Tropospheric Radio Propagation arranged in accordance with the topics to be discussed at the XIII General Assembly in London 1960. The bibliography includes principally the papers published since the XII General Assembly. The topics include the physical characteristics of the troposphere, theories on the tropospheric propagation, experimental results from investigation of tropospheric propagation, and radio meteorology. *Subject Headings:* **1. Tropospheric radio wave propagation 2. Radio meteorology 3. Tropospheric radio wave propagation bibliographies. I. Gerks, I. H.** (*chairman*)—*E.Z.S.* Ⓢ

12.8–112 551.510.535:551.510.62:06.045

†National Research Council, Wash., D. C. U. S. National Committee on the International Scientific Radio Union, **Report of U. S. Commission 3 on Ionospheric Radio Propagation, to the 13th General Assembly of the ISRU, London, Sept. 5–15, 1960.** *U. S. National Bureau of Standards, Journal of Research, Section D*, 64(6):629–636, Nov./Dec. 1960. Bibliog. p. 634–637. **DWB, DLC**—This review of U. S. activities and progress within ionospheric radio propagation between Jan. 1957 and Dec. 1959 is arranged as follows: Structure of the upper atmosphere, ionizing radiations, electron densities, satellite beacon studies, ionospheric processes, ionospheric disturbances, sporadic E and spread F, studies of the lower ionosphere, radar studies of auroral ionization, refraction in the ionosphere, ionospheric propagation studies, ionospheric scatter transmissions and radio reflection from meteor ionization, ionospheric propagation research with communication systems applications. An excellent bibliography of current material, arranged alphabetically by authors is given. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Ionospheric research.**—*W.N.* Ⓢ

12.8–113 551.510.535:551.510.62 551.510.52:551.510.62

†Joint Technical Advisory Committee (IRE-RTMA), **Radio transmission by ionospheric and tropospheric scatter, Pt. 1, Ionospheric scatter transmission.** *Institute of Radio Engineers, Proceedings*, 48(1):4–29, Jan. 1960. 23 figs., tables, 83 refs. **Pt. 2, Long-range tropospheric transmission.** *Ibid.*, p. 30–44. 10 figs., tables, 43 refs. "This is a supplement to the earlier comprehensive report, **Radio spectrum conservation,** issued by the Joint Committee of the Institute of Radio Engineers and the Radio Television Manufacturers Association, (abstracted separately), published N. Y., McGraw-Hill, 1952." **DLC**—The ionospheric and tropospheric scatter communication techniques are summarized individually; the present knowledge on ionospheric propagation theories, instrumentation practice, etc. including frequency allocation, is treated in the first part. Second part deals with the same as applied to the troposphere. *Subject Headings:* **1. Scatter propagation. I. Institute of Radio Engineers II. Radio-Television Manufacturers Association.**—*W.N.*

12.8–114 551.594.6:621.396.8:06.045

†National Research Council, Wash., D. C. U. S. National Committee on the International Scientific Radio Union, **Report of U. S. Commission 4 on Radio Noise of Terrestrial Origin, to the 23th General Assembly of the ISRU, London, Sept. 5–15, 1960.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(6):637–654, Nov./Dec. 1960. Bibliog. p. 652–654. **DWB, DLC**—This critical review of U. S. research activities 1957–1960 includes a bibliography of current material and the following papers: Radio frequency radiation from lightning discharges, properties of atmospheric noise at various receiving locations, summary of research on whistlers and related phenomena, a summary of *VLF* and *ELF* propagation research, hydromagnetic waves and *ELF* oscillation in the ionosphere, the exosphere. *Subject Headings:* **1. Radio noise 2. Sferics properties 3. Whistler research. I. Crichlow, William Q.** (*ed.*).—*W.N.*

12.8–115 551.501.9:621.396.62

Ives, Ronald L. (*Palo Alto, Calif.*), **Audio systems for radio-range station weather receivers.** *American Meteorological Society, Bulletin*, 41(6):313–316, June **1960.** 4 figs., 6 refs. **DWB, DLC**—Tested circuits for converting long-wave radio-range station receivers from headset to loudspeaker operation for installing an impulse noise limiter, and for adding a tuning indicator, are here presented with constants and operational explanations. *Subject Headings:* **1. Radio-range station weather receivers 2. Audio systems.**—*Author's abstract.*

C. ASTRONOMY AND ASTROPHYSICS

C1. ASTRONOMY

See also: **Observer's Handbook,** 12.8–26.

12.8–116 551.508.953 535.035.072

Fehrenbach, Ch., **Le nouveau spectrographe installé au foyer coudé du télescope de lm93 de l'observatoire de Haute-Provence.** [The new spectrograph set up at the bent focus of the lm93 telescope at the Haute-Provence Observatory.] *L'Astronomie*, Paris, 74(5):193–200, May **1960.** 8 figs., 3 plates. **DLC, NNC, DWB**—Review of some recent discoveries due to spectrography and especially the identification of radial elements and speeds, the study of lines contour and the temperature of stars. With a view to pursuing its astrophysical research the Observatory of Haute-Provence has built a luminous and efficacious spectrograph. The author gives the principal characteristics of this new spectrograph which has been mounted at the bent focus of the 1.93 m telescope of the Haute-Provence Observatory, in a large laboratory with constant temperature. The instrument was tested for the first time on the sky on July 17, 1959; the first plates obtained are described and the preliminary results published. *Subject Headings:* **1. Spectrographs 2. Haute-Provence Observatory, France.**—*A. V.* Ⓢ

12.8–117 523:91:061.2(73)

Abell, George O. (*Univ. of Calif., Los Angeles*), **The National Geographic Society—Palomar Observatory Sky Survey.** *Astronomical Society of the Pacific, San Francisco, Leaflet*, No. 366, Dec. **1959.** 8 p. **DLC** (QB1.A422)—A descriptive account of The National Geographic Society—Palomar Observatory Sky Survey. The survey was completed in only seven years with the help of the 48-in. Schmidt telescope on Palomar Mountain. Three close-approaching asteroids, thirteen new comets and thirteen new globular clusters were discovered on the Sky Survey. Also discovered were eighty-six new planetary nebulae. Other details of this survey and its great significance for astronomers are described in an interesting manner. *Subject Heading:* **1. National Geographic Society—Palomar Observatory Sky Survey.**—*I.S.* Ⓢ

12.8–118 52:06 551.510.53:629.19

Struve, Otto (*Natl. Radio Astronomy Obs.*), **Astronomers in turmoil.** *Physics Today*, N. Y., 13(9):18–23, Sept. **1960.** 6 photos. **DWB**—A discussion concerned with the shortage of senior level astronomers for current research problems. Some background information on the development of astronomy and the modern view of astronomy as part of physics are given. The practical aspects of space studies are explained and the objectives of Project Ozma are clarified. *Subject Headings:* **1. Astronomers 2. Project Ozma.**—*E.Z.S.* Ⓢ

12.8–119 535.24:523.6

Mirzoian, L. V. and Khachikian, E. E., **Issledovanie komety Mrkosa (1957 d), II, Fotometriia svecheniia komety.** [Investigation of the Mrkos comet (1957 d) Pt. 2, Photometry of the comet's luminosity.] *Akademiia Nauk Armianskoĭ SSR, Erivan. Biurakanaskaia Observatoriia, Soobshcheniia*, No. 27:15–30, **1959.** 20 figs. (incl. plates), 4 tables, 3 refs. Armenian summary p. 29–30. **DLC**—Five photographs of the Mrkos comet, taken at Byurakan in August 1957 on Kodak Oao film without light filter, were photometrically analyzed. Results of the analysis are reported in this paper and shown in isophote charts. Calibration and standardization of the negatives, construction of the isophotes, effects of length of exposure,

and effects of atmospheric absorption are discussed in detail. Gradients of surface brightness, the comet's total brightness, and variations of the isophotes in time are analyzed. *Subject Headings:* **1. Mrkos comet 2. Comet luminosity 3. Byurakan, Armenian S.S.R.**—*G.T.* Ⓢ

C2. ASTROPHYSICS

See: **Astrophysics** (Tikhov), 12.8–1; **Galactic and extragalactic research,** 12.8–3.

C3. SOLAR PHYSICS

See also: **Exploration of solar system** (Godwin), 12.8–30; **Arctic ionosphere and solar activity** (Gerson), 12.8–150.

12.8–120 551.521.67:621.396.8

Vitkevich, V. V. and Kameneva, Z. I., **Vybrosy radioizlucheniia na solntse.** [Outbursts of solar radio emission.] *Astronomicheskiĭ Zhurnal,* Moscow, 35(3):372–381, May/June **1958.** 9 figs., table, 6 refs. **DLC**—Presents the results of an analysis of observations conducted in Aug.–Sept. 1956 with a multichannel radio-spectrograph (12 channels covering the frequency range 165–82 Mc/s); these results yielded the following characteristics of the bursts: (1) intensity $1\text{–}10\times10^{-21}$ W m^{-2} $(c/s)^{-1}$; (2) drift velocity of the frequency is 70 (Mc/s)/sec for 200 Mc/s and 215 (Mc/s)/sec for 100 Mc/s; (3) the duration of the burst is usually (but not always) longer for lower frequencies; (4) the drift velocity is not related to the intensity or duration of radio emission, and (5) no reliable relationship has been found between the bursts and the chromosphere flares. *Subject Headings:* **1. Solar radio emission 2. Solar radio bursts 3. Chromosphere flares.**—*Physics Abstracts.*

12.8–121 523.72:539.1

Henryson, R. E. (*Griffith Obs.*), **Nuclear sunshine.** *Astronomical Society of the Pacific, San Francisco, Leaflet,* No. 363, Sept. **1959.** 8 p. table. **DLC** (QB1.A422)—In popular style the process explaining the immense energy output of the sun is described. The sun derives energy from nuclear reaction. Radical changes taking place in nuclear matter at extremely high temperatures generate the energy of solar nuclear reactions. The sun obtains it nuclear power by the fusion of four hydrogen nuclei (protons) into a helium nucleus. However, the process of sun's nuclear reactions is not the same as that associated with the H-bomb. The difference between the two processes is explained. *Subject Heading:* **1. Solar nuclear reactions.** —*I.S.* Ⓢ

12.8–122 523.745

Severnyĭ, A. B. (*Dir. d Astrophysik. Observs. a.d. Krim/UdSSR*), **Magnetische Kräfte in Sonneneruptionen.** [Magnetic forces in solar eruptions.] *Die Umschau,* Frankfurt a.M., 60(6):172–174, March 15, **1960.** 3 figs., 6 foot-refs. **DLC**—Recent studies of solar eruptions suggest that the extremely large energy turnover in sun plasma is influenced by the magnetic fields of the sun. In this field quick and strong compressions of the plasma occur (Pinch-effect) and when the compression speed is greater than the acoustic speed ("schall-geschwindigkeit") burst waves are created, by which the plasma is rebounced in a small area of about one km in diameter and its temperature rises suddenly to about 15 million degrees centigrade. The cause is the thermonuclear reaction and emissions of highly accelerated particles with energy of 10^9 to 10^{10} electron volts (cosmic rays) of x and γ rays as well as radio rays. These eruptive non-stationary processes, it is believed, are closely connected with the transformation of magnetic into heat energy on the sun and stars. *Subject Headings:* **1. Solar eruptions 2. Magnetic field of sun.**—*E.Z.S.* Ⓢ

12.8–123 523.746

Chernosky, E. J. (*GRD, AF Camb. Res. Center, Mass.*) and Hagan, M. P. (*Physics Dept., Emmanuel College, Mass.*), **The Zurich sunspot number and its variations for 1700–1957.** *Journal of Geophysical Research,* Wash., D. C., 63(4, Pt. 1):775–788, Dec. **1958.** 4 figs., 4 tables, 13 refs. **DWB, DLC**—A compilation of the monthly and annual daily relative sunspot

number is given for 1749–1957. Wolf's annual values are recompiled and given, back to 1700 from 1749. Tabular data include monthly, annual, and moving 11-year means and totals. Times of cycle minima and maxima and appearances of first and last spots are indicated. Graphical presentations are given for the annual, 11- and 22-year means, cycle means and cycle totals, and for some monthly and five-monthly means. A check for continuation of a relationship of secular change to cycle length is made. *Subject Headings:* **1. Sunspot data 2. Sunspot cycles 3. Zurich sunspot number variation.**—*Author's abstract.*

12.8–124 523.75

Severnyĭ, A. B., **Solar flares as a pinch-effect.** *International Astronomical Union, Transactions*, 10:647–648, **1958.** 10 refs., eq. **DLC** (QB1.I6)—A brief discussion of the properties of some flares examined a high dispersion and resolving power with the solar tower telescope in the Crimea. The properties of solar flares are summarized under seven headings relating to phenomena such as spectral emission of flares, classification of flares, physical state of plasma at the periphery of a flare, properties of moustaches and solar magnetograph measurements of magnetic fields in active regions. *Subject Headings:* **1. Solar flares 2. Pinch effect in solar flares.**—*I.S.*

12.8–125 523.746 523.77

Servajean, R., **Sur une évolution du profil des raies spectrales dépendant sans doute du gradient des vitesses de la matière dans l'atmosphère où elles prennent naissance.** [Evolution of the profile of the spectral lines probably depending on the speed gradient of the substances in the atmosphere where they have their origin.] *Académie des Sciences, Paris, Comptes Rendus*, 250(16):2801–2803, April 20, **1960.** fig., 2 refs. **DWB, DLC**—On high definition spectra concerning sunspots, local modifications of the profile of the lines are observed. However, it depends on the point considered on the spot and the position of the spot with respect to the center of the disc. This effect is weak and generally nonexistent for spots situated near the center of the disc; it is more marked for spots located near the rim and concerns mainly regions of the penumbra. It is rarely observed in the umbra. The direction in which it is observed generally prolongs the Evershed effect. The phenomenon is only visible in the dark parts of the penumbra or of the granulation; this seems to indicate that it can only appear when the degree of transparency of the solar atmosphere is relatively high. The hypothesis is expressed that this effect is bound to the gradient, following the line of sight, of the speeds of the substance in the layers were the lines are formed. *Subject Headings:* **1. Sunspots 2. Sunspot spectrum 3. Spectral line profiles.**—*A.V.* Ⓢ

12.8–126 523.755:523.036.515

Burgess, Alan (*Dept. Physics, Univ. Coll., London*), **A note on the calculation of coronal ionization cross-sections.** *Astrophysical Journal*, Chicago, 132(2):503–505, Sept. **1960.** 2 figs., 4 refs. **DWB, DLC**—In view of the recent publication of Schwartz and Zirin (1959) on ionization cross sections for Fe XIV, calculated by taking into account only S-waves for the initial state of the colliding electron, it is important to point out that in calculating electron positive ion-collision cross sections, it is necessary to take into account contributions from a large number of orbital angular momentum states of the colliding electron. This fact may readily be understood in view of the very long-range field of attraction of the ion. From results obtained so far, the author finds that for optically allowed transitions, the dominant contribution to the cross section in fact usually comes from $l \gtrsim 2$ where l is the orbital angular momentum quantum number of the incoming electron. *Subject Headings:* **1. Ionization cross sections 2. Electron temperatures 3. Coronal temperatures.**—*E.Z.S.* Ⓢ

12.8–127 523.78

Kranjc, Aldo, **L'ecclisse totale di sole del 15 febbraio 1961.** [The total solar eclipse of Feb. 15, 1961.] *Coelum*, Bologna, 28(7/8):105–110, July/Aug. **1960.** fig., 3 tables, several eqs. **DLC**—A description of the solar eclipse to be observed all over the Tyrrhenian coast of Italy. Tables present detailed information regarding the expected phenomenon. *Subject Headings:* **1. Solar eclipse, Feb. 1961 2. Italy.**—*E.K.* Ⓢ

12.8–128 523.78:523.75:621.396.8

Sobolev, V. M., **O zatmenii solntsa 19 Aprelia 1958 goda.** [Solar eclipse of April 19, 1958.] *Priroda*, Moscow, 47(4): 110, April 1958. **DLC**—In this annular eclipse of the sun, the vertex of the cone of the lunar shadow will not reach the earth so that a widened portion of the cone will fall upon the earth. This natural shading of the sun separates the radio radiation of individual phenomena of solar activity from the general radio radiation so that valuable data on the chromosphere and solar corona can be obtained. The annular eclipse will pass through India, Indo China, along the southern coasts of China and Japan. As a partial eclipse it will appear in central Asia, the Far East and Siberia. *Subject Headings:* **1. Solar eclipse, April 1958 2. Annular solar eclipses.**—*I.L.D.*

C4. MOON

See: **Lunar theory** (Brown), 12.8–31.

C5. METEORS

12.8–129 551.507.362:523.5

Nazarova, I. N., **Rocket and satellite investigation of meteors.** *International Astronomical Union, Transactions*, 10:713-714, 1958. **DLC** (QB1.I6)—The equipment used in the U.S.S.R. for recording meteor particles by means of rockets and satellites, reportedly records not only the number of impacts but measures also certain mechanical parameters of the meteor particles. The functions of a measuring device are briefly reported. The preliminary data obtained by rocket and satellite investigation of meteors are also cited and discussed. *Subject Headings:* **1. Rocket and satellite investigation of meteors 2. Meteors.**—*I.S.*

12.8–130 552.6:523.51

Mosebach, R. (*Mineral.-Petrol. Inst. & Museum of Univ. Münster*), **Der Meteoritenfall von Ramsdorf am 26. July 1958.** [The meteorite fall at Ramsdorf, July 26, 1958.] *Umschau*, Frankfurt, a.M., 58(17):525, Sept. 1, 1958. photo. **DLC** (552.6:523.51)—The circumstances surrounding the meteorite fall which occurred on July 26, 1958 in Ramsdorf, Borken district in Westphalie are described. The recovered stone mass weighed 4680 grams. The exterior was smooth and covered by a dark gray molten surface 0.2 to 0.5 mm thick. Fresh, bright gray flakes revealed a finely ground dense texture of a silicate mass and glistening inlays of nickel iron. The meteorite is a chondrite. The Polarization microscopic examination disclosed 88% by weight MgFe silicate, 11% iron and 4% troilite (iron sulfur). *Subject Headings:* **1. Meteorite, July 26, 1958 2. Ramsdorf.**—*I.L.D.*

12.8–131 523.51

Weiss, A. A. and Smith, J. W. (*Division of Radiophysics, C.S.I.R.O., Univ. of Adelaide*), **A Southern Hemisphere survey of the radiants of sporadic meteors.** *Royal Astronomical Society, London, Monthly Notices*, 121(1):5–16, 1960. 10 figs., 6 refs., eqs. **DWB, DLC**—A further survey of sporadic meteor activity, from Dec. 1956 to Aug. 1958, has been made with 67 mc/s narrow-beam equipment operated at a limiting line density close to $10''$ electrons/cm. Analysis of the echo rates suggests that the sporadic radiant distribution may be sharply divided into two components. One component is concentrated towards the apex and corresponds to a distribution of orbits uniform in heliocentric co-ordinates except for a moderate preponderance of direct over retrograde orbits, The other component lies close to the plane of the ecliptic, with radiants strongly concentrated in two regions centered on longitudes $\pm 68°$ from the apex. No change is apparent in the radiant distribution as the limiting sensitivity is lowered from the 3rd to the 7th visual magnitude. *Subject Headings:* **1. Meteors 2. Radiants of sporadic meteors.**—*Authors' abstract.* Ⓢ

C6. ECLIPSES

See: **Movements in F region during solar eclipse** (Bhargava, Subrahmanyam), 12.8–146.

C7. PLANETS

See also: **Transfer of radiant energy in stellar and planetary atmos.** (Sobolev), 12.8–8.

12.8–132 521.91

Kulikov, D. K. (*Inst. Theoretical Astron. AN SSSR*), **A method for correcting planetary positions for aberration.** *Soviet Astronomy AJ*, New York, 3(2):332–340, March/April **1959.** fig., 2 tables, 10 refs., 20 eqs. **DLC.** Transl. of original Russian, **Ob uchete aberratsii planet,** in *Astronomicheskiĭ Zhurnal*, Moscow, 36(2):340–347, March/April **1959. DLC**—It is shown that the generally adopted methods of computing the apparent positions of planets do not provide the necessary accuracy for the ephemerides of outer planets (0^s.001 in α and 0″.01 in σ). A system of formulas and rules for taking the aberration of planets into account with accuracy of 0″.001–0″.002 is given. *Subject Heading:* **1. Planetary position correction.**—*Author's abstract.* Ⓢ

12.8–133 523.481

Lyttleton, R. A. (*St. John's College, Cambridge, Eng.*), **Rediscovery of Neptune.** (In: Beer, (*ed.*), **Vistas in Astronomy,** Vol. 3, pub. **1960.** p. 25–46. 6 figs., 10 tables, 4 refs., 24 eqs.) **DWB** ((520.82 B415v), **DLC** (QB3.B35)—The methods used by Adams and Le Verrier for the prediction of the position of Neptune led to extremely extensive calculations, and the question still remains open whether any simpler approach is possible that could have led to comparably accurate prediction with much reduced effort of calculation. Such a method is presented. It turns out that the time of conjunction with Uranus can be derived with very little calculation using only elementary considerations applied solely to the (observed) discrepancies in heliocentric longitude. The instant so found is only about six months later than the actual value. On the basis of a circular orbit for the unknown planet, its position at discovery (25 years later than conjunction) even using Bode's law for the size of orbit is then only some 13° away from the actual position, and in fact within the zone that Challis began to search, and so probably sufficient for ultimate discovery. However, the distance appropriate to a best-fit of the observations can also be found and this makes a considerable improvement in the predicted position. By suitably combining the equations of condition, the number of unknowns associated with the necessary correction of the orbit of Uranus can be reduced from four to two, and with any assumed radius for the (circular) Neptune orbit only the mass of the planet is unknown. Thus the number of unknowns can be reduced to three (for each assumed mean distance) compared with eight in the original methods. Even with the extra work of calculation of the coefficients in the perturbations for a sufficient number of assumed mean distances, there results an enormous reduction in the amount of calculation. For the demonstration of the method, further economy of arithmetic has been achieved by making use only of a part of the observational material that was actually available at the time (the so-called "modern" observations). Nevertheless, the procedure succeeds in predicting a position of Neptune (in 1846) with the same accuracy (1°) as Le Verrier and more accurately than Adams (2½°). *Subject Heading:* **1. Neptune.**—*Author's abstract.*

12.8–134 551.5:523.43

Brouet, J. F., **La planète Mars au périgée.** [Planet Mars at the perigee.] *Ciel et Terre*, Brussels, 72(7/8):437–440, July/Aug. **1956. DWB**—In 1956 conditions for observing Mars are the most favorable of this century. The author discusses the various problems which may be solved during this period of optimum conditions, including meteorological measurements, such as detailed pressure and temperature determinations. A committee was formed in 1953, whose task it will be to coordinate research efforts of astronomers, physicists, meteorologists, etc. engaging in Martian studies. *Subject Headings:* **1. Martian research 2. Mars 3. Martian meteorology.**—*G.T.*

C8. RADIO ASTRONOMY

See also: **Outbursts of solar radio emission** (Vitkevich, Kameneva), 12.8–120; **Atmos. radio noise** (Ellis), 12.8–165.

12.8–135 551.521.67:621.396.8 523.164.82

Maxwell, Alan; Swarup, G. and Thompson, A. R., **The radio spectrum of solar activity.** (In: Menzel, Donald H. (*ed.*), **The radio noise spectrum.** Cambridge, Mass., Harvard Univ.

Press, 1960. p. 101–110. 4 figs., table, 10 refs., 5 eqs.) DWB (621.38411 M551ra), DLC—A new set of observations of bursts of radiation have been taken at the Harvard Radio Astronomy Station, Fort Davis, Tex., since Sept. 1956. The new equipment covers the range 100–580 Mc/S. The equipment, its operation and calibration are explained. The sensitivity and the frequency range of the equipment have given information about the spectrum of bursts. The characteristics of the spectral classes are summarized briefly, and illustrated with examples from the records. A noise storm consists of a long series of short bursts continuing over hours or days. A slow burst appears as a narrow band of intense radiation which drifts gradually, and sometimes irregularly, toward lower frequencies. Fast bursts have durations of a few seconds and show exceedingly rapid drifts toward lower frequencies. The observations have also revealed a new type of fast burst which appears on the records in the form of an inverted *U*. These bursts show a rapid decrease in frequency followed by an increase and have a duration of a few seconds. At times an extremely intense form of continuum radiation is observed covering a frequency band of more than 300 Mc/S. It often occurs after great outbursts, and may last 10–300 minutes. This radiation probably corresponds to that described by BOISCHAT (1957) from single-frequency observations at 169 Mc/S, as "Type IV" radiation. *Subject Headings:* **1. Solar radio burst classification 2. Noise storms 3. Slow-drift bursts 4. Fast-drift bursts 5. Continuum radiation 6. Fort Davis, Tex.**—*E.Z.S.* Ⓢ

12.8–136 551.594.51:621.396.1

†Peterson, Allen M., **The aurora and radio wave propagation.** (In: Menzel, Donald H. (*ed.*), **The radio noise spectrum.** Cambridge, Mass., Harvard Univ. Press, **1960.** p. 7–42. 27 figs., 3 tables, 47 refs., eq.) **DWB** (621.38411 M551ra), **DLC**—The influence of the aurora on radio wave propagation is discussed in considerable detail. Following a review of visual and optical studies of the aurora, radio and radar observation of the aurora and the geometry of radar reflections from the aurora are explained. Stanford Research Institute has recently designed high-sensitivity equipment for the study of auroral radar characteristics. Photographs of the parabolic antenna at Stanford and at College Alaska are included. Records of auroral echo illustrate the studies reported. Although much more experimental evidence will be required before the characteristics of auroral noise can be understood, it now appears that positive evidence for its occurrence has been obtained. Frequency dependence, directional dependence, and polarization characteristics should all be measured in order to develop clues to the mechanism of generation of noise. FORSYTH, PETRIE, and CURRIE have suggested that plasma oscillations of the ionized volume was a possible source of noise, and HARTZ has suggested that ČERENKOV radiation is a more likely cause. Another possible mechanism which should be investigated is synchrotron radiation from high-energy electrons spiraling in the earth's magnetic field. *Subject Headings:* **1. Radio waves from auroras 2. Auroral radio wave sources 3. Radio wave propagation.**—*E.Z.S.* Ⓢ

12.8–137 523.164.3/4

Mirzabekian, E. G., **Metod opredeleniia s vysokoĭ tochnost'iu koordinat kosmicheskikh isotochnikov radioizlucheniia.** [Method of determining the coordinates of cosmic radio sources with high accuracy.] *Akademiia Nauk Armianskoĭ SSR, Erivan. Biurakanskaia Observatoriia, Soobshcheniia, No.* 27:31–34, **1959.** 2 figs., 2 refs., 3 eqs. Armenian summary p. 34. **DLC**—In two previous papers the author described a device improving the accuracy of polarization radiometers. By using a symmetrical annular conducting irradiator the directional diagram of the antenna in the *E* plane is made to become wider than the diagram in the *N* plane. In this paper another refinement is introduced. By varying the size of the annular slot of the irradiator the difference in the widths of diagrams in the *E* and *N* planes is increased, thereby increasing the directional accuracy of the polarization radiometer. The accuracy of this method exceeds that of ordinary measurement with single parabolic antennas by at least one order of magnitude in determining angular coordinates of cosmic radio sources. *Subject Headings:* **1. Cosmic radio source coordinates 2. Polarization radiometers.**—*G.T.* Ⓢ

12.8–138 523.164.8:523.851

Menzel, Donald H., **A study on cosmic radio noise sources.** (In: Menzel, Donald H. (*ed.*), **The radio noise spectrum.** Cambridge, Mass., Harvard Univ. Press, **1960.** p. 151–176.

6 figs., 4 tables, 6 refs., eqs.) **DWB** (621.38411 M551ra), **DLC**—A map of radio noise levels from various parts of the sky has been compiled. The source material consisted of published surveys of cosmic noise by various investigators. The data required evaluation and preliminary reduction to a common half-power beamwidth. Only two basic maps were necessary, one for 200 Mc/S and 10° beam and the other for 600 Mc/S and 2° beam. The unit chosen for the sky brightness is the decibel, and the reference level is 1°K. The distribution of cosmic noise at any frequency may be determined. This paper also contains a tabulation of the intensities of the discrete sources of cosmic radio radiation, as seen at various frequencies in a 2° beam. These intensities may be converted into intensities at any other half-power beamwidth. An estimate of the contributions of bodies in the solar system to the cosmic radio interference is included. The radio sky maps, the horizon-coordinate grids, nomograms for conversion of coordinates and the spectral-low nomogram are illustrated. *Subject Headings:* **1. Radio noise sources 2. Cosmic radio noise map.**—*E.Z.S.* Ⓢ

12.8–139 550.372

†Stanley, Glenn M. and Davis, T. Neil, **Auroral zone absorption of radio waves transmitted via the inosphere Task D, Studies of ground conductivity.** Alaska. Univ. Geophysical Institute, Contract DA 36-039-Sc-5512, Final Report, July 1, 1952 to June 30, **1953.** 59 p. 13 figs., 6 tables, 34 eqs. 23 refs.—Four methods of determining ground conductivity have been investigated as to the feasibility of their use in Alaska. These methods are the wave tilt method, soil sampling, resistivity surveys, and the attenuation method. The most practical means of determining the ground conductivity appears to be a combination of two of these methods. The dielectric constant of the ground is determined by soil sampling and the ground conductivity is then determined by attenuation studies. The most serious difficulty encountered during these studies has been that of transportation. Several field trips have been made to investigate the methods mentioned and to study the logistical problems that might arise. Satisfactory solution of the transportation problem has been made. The wave tilt method does not appear to be satisfactory at low frequencies. A correlation between the measured tilt angle and the local ground contours around the apparatus was obtained. Resistivity surveys were made of several different types of terrain and the ground conductivity of these sites was computed. Laboratory methods of measuring the ground conductivity and the dielectric constant were utilized. Soil samples were obtained at several sites in the vicinity of Fairbanks and the dielectric constants and the ground conductivity were measured. Investigations of the effect of moisture content and of the temperature of the soil were made. As the attenuation method appears to be the most practical way to determine the ground conductivity, most emphasis was placed on the problem of obtaining field intensity measurements from the air. The method consists of obtaining field intensity measurements from the air at low altitudes at varying distances from the transmitter. The ground conductivity is then obtained by comparison of the experimental values of field intensity vs. distance with theoretical curves for assumed values of the ground conductivity and dielectric constant. As permafrost covers large sections of Alaska and is probably an important factor in the ground conductivity, a cursory examination of permafrost conditions in Alaska was made and is included in this report. *Subject Headings:* **1. Ground conductivity determination 2. Permafrost in Alaska 3. Alaska.**—*Authors' abstract.*

128–140 551.510.535:551.510.62:621.396.8

Ellis, G. R. A. (*C.S.I.R.O., Australia*), **Spaced observations of the low-frequency radiation from the Earth's upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 66(1): 19–23, Jan. **1961.** 4 figs., table, 12 refs., eq. **DLC**—Observations of 5 kc/s radio noise with a network of four stations extending across southern Australia are described. It is shown that there is often good correlation of the amplitude variations over a distance of 3000 km and that the observed amplitude differences may be explained by assuming that the radiation propagates in the earth-ionosphere wave guide from geographically large sources. Some discrete sources were observed. *Subject Headings:* **1. Upper atmosphere radiation 2. Low frequency radiation 3. Radio noise 4. Australia.**—*Author's abstract.* Ⓢ

12.8–141 551.510.535:551.594.13:662.2:539.1

Crain, C. M. and Tamarkin, P. (*both, Rand Corp., Santa Monica, Calif.*), **Note on the cause of sudden ionization anomalies in regions remote from high-altitude nuclear bursts.** *Journal of Geophysical Research*, Wash., D. C., 66(1):35–39, Jan. **1961.** fig., 17 refs. **DLC**—Sudden changes of VLF propagation characteristics, caused by the very high altitude Hardtack nuclear detonations in the summer of 1958, occurred on propagation paths thousands of kilometers from the burst point. The anomalies were caused by bomb-induced ionization in the ionospheric D layer, and their onset was much more sudden than those occasioned by natural phenomena such as solar flares. The model discussed provides an explanation of how ionization is suddenly produced in ionospheric regions shadowed from a high-altitude detonation or its conjugate point. *Subject Headings:* **1. Nuclear detonation effects on VLF propagation 2. Ionization anomalies.**—*Authors' abstract.*

12.8–142 523.164:551.510.535:551.510.62

Benediktov, E. A., **Ob odnom radioastronomicheskom metode opredeleniia pogloshcheniia radiovoln v ionosfere.** [A radio astronomical method for determining radio wave absorption in the ionosphere.] *Radiotekhnika i Elektronika*, Moscow, 4(7):1201–1202, July **1959.** 6 refs., 7 eqs. **DLC**—A method is described whereby ionospheric absorption is determined on the basis of the difference between the absorption of the ordinary and that of the extraordinary ray. The method has the advantage of not requiring long series of measurements. For moderate latitudes it requires an instrumental sensitivity within 1% of the measured values. With such instrumental sensitivity the method may be used even more effectively in polar regions, but it cannot be recommended for equatorial measurements. *Subject Headings:* **1. Ionospheric radio wave absorption 2. Radio wave absorption measurement techniques.**—*G.T.*

12.8–143 523.164:522.1

Associated Universities, Inc., N. Y., **The National Radio Astronomy Observatory operated by Associated Universities, Inc. under contract with the National Science Foundation.** N. Y., Oct. **1959.** 36 p. Photos. **DLC** (QB475.A1A8)—The National Radio Astronomy Observatory, in the Allegheny Mountains of West Virginia, is a new research center dedicated to radio astronomy. It is operated by Associated Universities, Inc. under contract with the National Science Foundation. Its purpose is to provide the large and precise radio telescopes, receivers, and other equipment needed for the detection and analysis of signals from outer space. NRAO provides the means for advanced experiment and observation to visiting scientists from universities that lack large facilities for research in radio astronomy. This brochure explains radio astronomy and discusses radio telescopes and outlines celestial sources of radio signals. A brief history of NRAO, its facilities, equipment and staff are given. Illustrations of various radio astronomy facilities, photographs of nebulae, planets, galaxies, etc., are included. *Subject Headings:* **1. Radio astronomy observatories 2. Radio astronomy research equipment 3. National Radio Astronomy Observatory.**—*E.Z.S.*

12.8–144 523.164.08

Vitkevich, V. V., **Moshchnyĭ radioteleskop v Krymu.** [Powerful radio telescope in the Crimea.] *Akademiia Nauk SSSR, Vestnik*, 27(11):110–112, Nov. **1957.** fig., ref. **DLC.** Review in *Naturwissenschaftliche Rundschau*, Stuttgart, 11(4):147–148, 1958.—A new type of radio telescope is in use at the P. N. Lebediev Institute of Physics of the Academy of Sciences of the U.S.S.R. The parabolic mirror has a diameter of 31 m and its axis has a declination of +22°. The antennae in dipole and in funnel form are in a truck capable of moving ±50 cm in east–west direction; this truck rests upon a frame capable of moving 30 cm north–south direction. The antennae can be moved ±1–2° in space. The observation program includes the intense galactic radio source Taurus A (Crob-Nebula NCC 1952), in particular the spectral intensity distribution of nonthermal radiation. The large mirror can be combined with a parabolic reflector of 18×8 m for interferometric purposes; that is measurements with extreme angular resolution in a coordinate. *Subject Headings:* **1. Radio telescopes 2. Crimean A.S.S.R.**—*I.L.D.*

D. OUTER ATMOSPHERE

D1. IONOSPHERE

See also: **Report of U. S. Commission 3 on Ionospheric Radio Propagation,** 12.8–112; **Radio transmission by ionospheric and tropospheric scatter,** 12.8–113; **Obs. of low frequency radiation from upper atmos.** (Ellis), 12.8–140; **Sudden ionization anomalies in regions remote from high altitude nuclear tests** (Crain, Tamarkin), 12.8-141; **Radio astron. method for determining radio wave absorption in ionosphere** (Benediktov), 12.8–142; **Ionospheric absorption** (Campbell, Leinbach), 12.8–168.

12.8–145 551.510.535:621.396.812

Bennington, T. W., **Equatorial ionospheric effects: part-sunset fading on long-distance radio circuits.** *Wireless World*, London, 66(10):501–506, Oct. 1960. 5 figs., 2 tables, 5 refs. **DLC**—An account is given of the discovery of the spread-F effect and the rise in the F2 layer virtual height which occurs in equatorial regions. At most places this phenomenon is observed soon after local ground sunset, and lasts for about four hours, after which conditions return to normal. It generally occurs more frequently at the equinoxes and is worse during years of high sunspot activity. It appears to be brought about by conditions in the ionosphere in a zone lying near the magnetic equator. The radio fading which occurs can be serious for some types of equipment. A detailed analysis is given of fading effects at Singapore, Johannesburg and Ibadan for various months during the years 1954 to 1958 to illustrate the main effects. *Subject Headings:* **1. Spread F 2. Radio fading.**—*R.B.* Ⓢ

12.8–146 551.510.535:523.78

Bhargava, B. N. and Subrahmanyam, R. V. (*both, Kodaikanal Obs., Kodaikanal*), **Movements in the F region of the ionosphere during solar eclipses.** *Indian Journal of Meteorology and Geophysics*, Delhi, 11(4):363–370, Oct. 1960. 5 figs., 2 tables, 11 refs. **DWB, DLC**—F layer ionospheric data collected during the partial solar eclipses of June 20 and Dec. 14, 1955 have been analyzed. In order to study the effects of the eclipses at several heights, the electron density-height profiles have been obtained from the h'—f curves for several levels between 250 and 400 km. Assuming a model of the ionosphere in which electron loss is by an attachment process, the magnitudes of the movement terms of the continuity equation have been derived and discussed for the two eclipses and their respective control days. *Subject Headings:* **1. F region data 2. Solar eclipse effects on F region 3. Electron density-height profiles.**—*Authors' abstract.* Ⓢ

12.8–147 551.510.535:551.510.62:621.396.9

Cilliers, W. A. (*Cavendish Lab., Cambridge*), **The fading of low-frequency radio waves reflected from the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 19(2):102–114, Oct. 1960. 13 figs., 2 tables, 6 refs., 7 eqs. **DLC**—A study has been made of the fading of radio waves of frequency 70–200 kc/s reflected at steep incidence from the ionosphere. It is shown that the amplitude fading on 113 kc/s is sufficiently consistent to be represented by an average correlogram. Some measurements of the complex amplitude are reported and the correlograms deduced from them are compared with those derived from measurements of real amplitude. On all frequencies there is a component of fading with a correlation time (to e^{-1}) of order 90 sec corresponding to a fading period of order 7–5 min and there is some evidence that this component of the fading is quasi-periodic. This quasi-periodic component is noticeable on a cross correlogram relating measurements made simultaneously on waves of quite different frequencies, from which it is deduced that it is caused by a quasi-sinusoidal irregularity in the ionosphere, which affects all the frequencies. Observations at three spaced receivers show that these irregularities have a spatial period of order 20 km and that they travel with speeds of about 35 m sec^{-1}. This drift of the irregularities is an important cause of the fading. On the higher frequencies there is clear evidence of a more rapid component of fading with a correlation time of the order 50 sec. *Subject Headings:* **1. Radio wave reflection from the ionosphere 2. LF radio wave reflections 3. Radio wave fading.**—*Author's abstract.* Ⓢ

12.8–148 551.510.535:538.69:532.59

Francis, W. E. and Karplus, Robert (*both, Lockheed Aircraft Corp., Palo Alto, Calif.*), **Hydromagnetic waves in the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 65(11):3593–3600, Nov. 1960. 6 figs., 4 tables, 12 refs., 22 eqs. **DWB, DLC**—The numerical integration of the hydromagnetic wave equations in the ionosphere has been carried out. Tables and graphs are given for the relations between the field amplitudes above and below the ionosphere and for the power dissipated as a function of altitude. The case of a vertically incident plane monochromatic wave near 45° geomagnetic latitude is treated. The results are used to confirm earlier estimates of ionospheric heating by hydromagnetic waves and to estimate the transit time of extremely low-frequency signals. *Subject Heading:* **1. Hydromagnetic waves in ionosphere.**—*Authors' abstract.* Ⓢ

12.8–149 551.510.535:551.594.12:551.510.62:621.396.1

Fulton, B. J.; Petrie, L. E. and Ward, W. S. P. (*all, Defence Res. Board, Ottawa, Canada*), **Transient modes of high-frequency radio wave propagation across the auroral zone.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):185–186, Oct. 1959. fig., ref. **DWB, DLC**—Records of sweep frequency oblique incidence radio soundings have been made over a path between Winnipeg and Resolute Bay, since Oct. 1958. The records at both ends of the circuit indicate extra reflections. The occurrence of these extra traces may be due to irregularities in the auroral zone ionosphere that act as scattering sources. *Subject Headings:* **1. Radio wave propagation across auroral zone 2. Winnipeg, Canada 3. Resolute Bay, Canada.**—*O.T.*

12.8–150 523.746:551.510.535(98)

*Gerson, N. C., **The Arctic ionosphere and solar activity.** *Annales de Géophysique*, Paris, 16(2):253–261, April/June 1960. 4 figs., 7 tables, 13 refs. **DLC**—Study of the correlations between the solar activity and the conditions of the arctic ionosphere based on observations during 1941–1958 at five Arctic stations. The author successively examines the relationships between the Arctic noon E layer, the Arctic noon Fs layer, and the Arctic noon F2 layer and the solar activity. This study shows that changes in sunspot number have relatively little influence on (median, noon) Arctic E layer ionization. The F1 layer presents a greater sensitivity to the solar index and the correlation between the F2 layer and the solar activity is still much higher. These various correlation types are discussed and considerations on the various hypotheses are expressed with a view to explaining these correlations. *Subject Headings:* **1. Arctic ionosphere 2. Sunspot effects on ionosphere 3. Arctic.**—*A.V.* Ⓢ

12.8–151 551.558.29:551.510.535

Haubert, A., **A propos des grands mouvements verticaux de la région-F observés à Casablanca.** [Large scale vertical movements in the F region at Casablanca.] *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):145, Sept. 1959. French summary p. 145. **DLC**—Sudden vertical movements of the F region are observed at Casablanca with a frequency of a possible 10 days per month occurrence at 21 hrs and 10 hours a.m. These movements, without apparent records with geophysical or solar perturbations, seem to be interpreted like the phenomena of tides. *Subject Headings:* **1. F region 2. Large scale vertical motions 3. Ionospheric vertical movement 4. Casablanca, French Morocco.**—*Transl. of abstract (O.T.)* Ⓢ

12.8–152 551.524.77:551.510.535

Haubert, A., **Les gradients de témperature dans les régions-E et F1, d'après les sondages ionosphériques effectués à Casablanca.** [Temperature gradients in the E and F1 regions according to ionospheric soundings at Casablanca.] *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):83, Sept. 1959. fig. French summary p. 83. **DLC**—Interpretations of measurements at Casablanca on E and F1 regions lead to suppose, according to Chapman's theory that the temperature gradient is on the average positive in the E region and on the average, slightly negative in F1 region, with a seasonal variation marked sufficiently to effect ionization. *Subject Headings:* **1. E region 2. F1 layer 3. Ionospheric temperatures.**—*Transl. of author's abstract, O.T.*

12.8–153 551.510.535:551.594.13

Krasovskiĭ, V. I., **Some new ionizing agents and properties of the ionosphere.** *International Astronomical Union, Transactions*, 10:716–717, 1958. **DLC** (QB1.I6)—Investigations concerning the measurement corpuscular fluxes by means of the third sputnik are reported and discussed. Two fluorescent screens were used as indicators. Intense signals were registered by both indicators during the magnetic disturbances of 15 May 1958. The signal amplitude was larger in high latitudes than near the equator and seemed to be larger at greater heights than at lower ones. The signals registered are explained in terms of the irradiation of the screen with ions or x-rays or electrons. *Subject Heading:* **1. Ionospheric properties.**—*I.S.*

12.8–154 538:551.510.535:551.511.32

Lighthill, M. J. (*Royal Aircraft Establishment, Farnborough*), **Note on waves through gases at pressures small compared with the magnetic pressure, with applications to upper-atmosphere aerodynamics.** *Journal of Fluid Mechanics*, London, 9(3):465–472, Nov. 1960. 2 figs., 5 refs., 6 eqs. **DWB, DLC** —Most treatments of magnetohydrodynamic waves have confined physical interpretation to cases when the Alfven velocity a_1 is small compared with the sound velocity a_0. Here we consider the 'low-beta situation,' in which a_1 is much larger than a_0. Then, except for two modes with wave velocity a_1, the only possible waves are longitudinal ones, propagated unidirectionally along lines of magnetic force with velocity a_0. These can be interpreted as sound waves, confined to effectively rigid magnetic tubes of force. Hall-current effects do not alter these conclusions (in contrast to the high-beta situation), and finite conductivity introduces only small dissipation. An application is made to the flow pattern around a body moving through the F_2 layer of the ionosphere, where, although neutral particles have a very large mean free path, charged particles interact electrostatically and, it is argued, may be regarded as forming a continuous fluid whose movement is independent of that of the neutral particles. A body moving at satellite speed or below would then excite the above-mentioned unidirectional sound waves, but no waves at much faster Alfvén velocity. These considerations suggest that its movement would be accompanied by a *V*-shaped pattern of electron density (Fig. 2), which might be in part responsible for some anomalous radar echoes that have been reported. *Subject Headings:* **1. Magnetohydrodynamic waves 2. F2 layer 3. Satellite observations.**—*Author's abstract.*

12.8–155 551.501.7:551.507.362.1:551.510.535:551.594.12

Nisbet, John S. and Bowhill, S. A. (*both, Penn. State. Univ. Park, Penn.*), **Electron densities in the F region of the ionosphere from rocket measurements, Pt. 1, Methods of analysis.** *Journal of Geophysical Research*, Wash., D. C., 65(11):3601–3607, Nov. 1960. 5 figs., 11 refs., 8 eqs. **Pt. 2, Results of analysis,** p. 3609–3614. 10 figs., 6 refs. **DWB, DLC**—A method is described for analyzing dispersion records from long-range missiles in terms of equivalent electron-density and electron-content profiles above a fixed location. This method takes account of varying horizontal gradients in electron density and the varying local zenith angle of the ray as a function of range time and height in the ionosphere. Refraction has been considered for both Faraday rotation and range-error measurements, and correction factors are included in the program. Comparisons made between Faraday rotation and range error measurements and between Faraday rotation measurements at two locations demonstrated the validity of the reduction techniques. In Pt. 2, electron density distributions in the ionosphere derived from propagation measurements made during seven long-range missile flights are given. These results are compared with measurements derived from variable-frequency pulse soundings and with satellite and rocket measurements described by others. The vertical electron-density gradient was found to vary within quite a large range, being lowest for two firings that took place shortly after sunset and greatest for the one early-morning firing. The equilibrium electron-density variation with height was found to be consistent with the assumption of a Chapman layer, of varying scale height, based on a recent model of the neutral atmosphere derived from satellite retardation measurements. *Subject Headings:* **1. Rocket ionospheric measurements 2. Electron density in F2 region.**—*Authors' abstracts.*

12.8–156 551.507.362.1:551.510.535:551.594.13

Prenatt, Raymond E. (*Aberdeen Proving Ground, Md.*), **Faraday rotation measurements at Fort Churchill.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1340–1341, Sept.

1959. 2 figs., eq. **DLC**—The amount of Faraday rotation was obtained by taking the difference between true rocket spin and the spin measured by DOVAP. Then the total electron content was plotted vs. altitude. The results agree approximately with the values obtained by Naval Research Laboratories. *Subject Headings:* **1. Rocket ionospheric measurements 2. Ionospheric electron density measurement techniques 3. Churchill, Canada.**—*E.Z.S.* Ⓢ

12.8–157 551.510.535:551.510.62:621.396.1

Rumi, G. C. (*Geophys. Inst. U. Alaska, College, Alaska*), **The D_1, D_2 layers and the absorption of radio waves.** *Journal of Geophysical Research*, Wash., D. C., 65(11):3625–3630, Nov. 1960. 5 figs., 7 refs., 4 eqs. **DWB, DLC**—The dependence and nondeviative radio absorption with frequency is analyzed for the case of a dichotomic absorbing region that obeys specific conditions. Selected experimental data are shown to match the theoretical predictions. It is inferred that absorption measurements may be used to study the splitting of the ionospheric D region into two layers. *Subject Headings:* **1. D layer 2. Ionospheric radio wave absorption.** —*Author's abstract.*

12.8–158 551.510.535:550.385

Suchy, Kurt and Vila, Paul, **Le champ magnétique dans la couche F2 à Dakar.** [The magnetic field in the F2 layer at Dakar.] *Annales de Géophysique*, Paris, 12(4):277–282, Oct./Dec. 1956. 5 figs., 8 refs., numerous eqs. **DLC**—Under the effect of the earth's magnetic field, the ionospheric plasma behaves as a birefringent medium; the electromagnetic wave is divided into ordinary and extraordinary components. The intensity of the magnetic field of the earth was determined at the maximum level of the F2 layer from the variation $f^o - f^z$. The variation found in the altitude corresponds to a dipole law. Therefore evidence can be given in a qualitative manner for the daily and annual variations of the field. Discussions of the calculations take into account the deviations of the rays. Data for 1953, 1954 at 300 km are illustrated. *Subject Headings:* **1. Ionospheric plasma 2. Earth's magnetic field effects 3. F2 layer 4. Dakar, French West Africa.**—*E.Z.S.*

12.8–159 551.510.535

Vitkevich, V. V. (*Acad. Scien., U.S.S.R.*), **On the degree of homogeneity of the quiet ionosphere.** *Soviet Astronomy AJ*, New York, 3(4):609–611, Jan./Feb. 1960. 5 refs., 5 eqs. **DLC.** Transl. of original Russian in *Astronomicheskiĭ Zhurnal*, Moscow, 36(4):623–625, July/Aug. 1959. **DLC**—During observations of radio stars by the radio interferometric method at meter wave lengths, a distinct interferometric pattern is observed in most cases when the ionosphere is not disturbed. This makes possible the estimation of the upper limit to the degree of nonuniformity of the electron plasma of the metagalaxy, galaxy, zodiacal light, and ionosphere. The estimate for a quiet ionosphere shows that if the size of the nonuniformities is 3–5 km, the total number of electrons in these nonuniformities is only 0.3–0.4% of the total number of electrons in a column of unit cross section. *Subject Heading:* **1. Ionospheric inhomogeneities.**—*Author's abstract.*

D2. GEOMAGNETISM

See also: **Waves through gases at low pressures** (Lighthill), 12.8–154; **Magnetic field in F2 layer, Dakar** (Suchy, Vila), 12.8–158; **Physical state of atmos.** (Obayashi), 12.8–170; **Nature and origin of radiation belts** (Singer), 12.8–172.

12.8–160 550.373:537.53

Yanagihara, Kazuo, **Induced polarization and earth-current.** *Kakioka, Japan. Magnetic Observatory, Memoirs*, 9(1):65–73, March 1959. 8 figs., 6 refs., 13 eqs. In Japanese; English summary p. 65. **DWB**—At the first and final times of introducing the direct current into the earth through two electrodes, a transient decaying potential difference is found sometimes between another pair of electrodes. This induced polarization was noticed by H. Note at 1930, and has been applied to electrical prospecting for ground water (M. Iwasa, 1942). Dielectric absorption of the layered earth for interpreting the phenomena became meaningless because the relaxation time by the theory was the order of $\epsilon/4\pi\sigma$, that was less than 10^{-3} sec (T. Kiyono, 1949). An alternative is proposed in this paper. That is the concentration cell

at the effective membrane formed by the capillary of clay particles. Distribution of these concentration cells in the ground determines the magnitude of the induced polarization voltage of which observed value reaches sometimes to some tenths of the voltage measured between the electrodes at the stationary state. These large observed values were not discussed in the paper by VACQUIER et al. (1957) who proposed the concentration cell earlier. But their cells are formed at the capillary between sand particles to which clay adheres, and clay plays the role in the source of ions. The relaxation time of growth or decay of concentration cells at the capillary between clay particles in our theory is accounted as several seconds to some minutes: that is observed decay times. *Subject Heading:* **1. Induced polarization.**—*Author's abstract.*

12.8–161 551.521.67:550.38

Hamlin, D. A.; Karplus, R.; Vik, R. C. et al., **Mirror and azimuthal drift frequencies for geomagnetically trapped particles.** *Journal of Geophysical Research*, Wash., D. C., 66(1):1–4, Jan. **1961.** 4 figs., table, 4 refs., 23 eqs. **DLC** –For charged particles trapped in the geomagnetic field, the frequencies of the mirror oscillations ω_n and the azimuthal drift ω_d are defined as appropriate averages over the helical motion around the field lines and the mirror motion between reflection points in the two magnetic hemispheres. These integrals for ω_n and ω_d are evaluated numerically. Results are tabulated, illustrated, and represented by approximate analytical expressions. *Subject Headings:* **1. Geomagnetically trapped particles 2. Van Allen Belt. I. Watson, K. M.**—*Authors' abstract.* Ⓢ

12.8–162 550.380.61(52)

*Kakioka, Japan. Magnetic Observatory, **Geomagnetic observations made at Kakioka, Japan, 1956.** Its *Report* No. 26, **1959.** 68 p. 3 charts, numerous tables and graphs.—The geographic coordinates of the observatory are 140°11′21″E and 33°13′51″N and the height above mean sea level is 28.2 m. The building and equipment are described. The instrument and form for the observation, the horizontal, vertical, declination intensity operated by variometers in relation to scale and base line values determined by the electric current, which can produce the discretely increasing magnetic fields from −400 r to +400 r for several minutes are discussed respectively. The results of observations (only in 1956) on hourly values of declination, horizontal and vertical intensity, mean hourly values of magnetic elements calm days, disturbed days, and all days, and of north and west components have been given in extensive tables including the results of three-hour-range indices and K and character figures, C, (*G.M.R.*), the general character of principal disturbances, and reproductions of magnetograms for disturbances which are shown in charts. *Subject Headings:* **1. Geomagnetic observations 2. Kakioka Magnetic Observatory 3. Kakioka, Japan.**—*K.C.* Ⓢ

12.8–163 551.521.64:550.385

Singer, S. Fred (*Univ. of Md., College Park, Md.*), **Latitude and altitude distribution of geomagnetically trapped protons.** *Physical Review Letters*, New York, 5(7):300–303, Oct. **1960.** 2 figs., 12 refs., 7 eqs. **DLC**—The research reported in this letter forms an extension of work reported in an earlier letter concerning the nature and properties of radiation belt particles. The existence and general trend of energies of the trapped protons and a maximum of the intensity located at between 1 and 2 earth radii were postulated. Presently, a theory for the injection coefficient is derived and its use is illustrated in calculating the latitude and altitude dependence. The results are graphically represented. The contours of equal counting rate show a remarkable resemblance to contours which have been obtained experimentally. *Subject Headings:* **1. Geomagnetically trapped protons 2. Trapped proton distribution 3. Van Allen Belt.**—*I.S.* Ⓢ

12.8–164 551.594.6:550.385.37

Campbell, Wallace H., **Natural electromagnetic energy below the ELF range.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(4):409–411, July/Aug. **1960.** 4 figs., 10 refs. **DWB, DLC**—The transition of natural signals from sferics slow tails to geomagnetic micropulsations was observed between 2.0 and 0.2 cycles per second. Micropulsations with periods of 5 to 30 seconds have characteristics which closely relate to solar terrestrial disturbance phenomena. The low latitude diurnal amplitude variation has maximums at

0945 and 1000 lmt. Similar groups of oscillations appear in Alaska and California. Simultaneous pulsation of λ 3914 aurora and magnetic field micropulsations has been observed in Alaska. *Subject Headings:* **1. Sferics 2. Geomagnetic micropulsations.**—*Author's abstract.* Ⓢ

12.8–165 550.385.4:621.396.8

Ellis, G. R. A. (*Commonwealth Sci. & Indus. Res. Organ., Camden, New South Wales*), **Observations of atmospheric radio noise.** *Nature*, London, 186(4720):229, April 16, **1960.** ig., 5 refs. **DWB**—It appears likely that there is a world-wide pattern of noise illumination during geomagnetic disturbances, although more examples are needed. Future studies of the world image at 5 kc/s may be made either with a network of ground receivers or with satellite receivers. For an instantaneous picture, ground receivers would be necessary. A comparison of geomagnetic and very low frequency noise records (Dec. 4, 1958) Kiruna, Sweden, and Camden, New South Wales show coincidence. *Subject Headings:* **1. Geomagnetic disturbances 2. Radio noise.**—*E.Z.S.* Ⓢ

D3. AURORAS

See also: **Auroral zone attenuation of HF radio waves** (Agy), 12.8–109; **Aurora and radio wave propagation** (Peterson), 12.8–136; **HF radio wave propagation across auroral zone** (Fulton et al.), 12.8–149.

12.8–166 551.594.51

Agy, Vaughn (*Natl. Bur. Standards, Boulder, Colo.*), **Spiral patterns in geophysics.** *Journal of Atmospheric and Terrestrial Research*, London, 19(2):136–140, Oct. **1960.** 3 figs., 7 refs. **DLC**—Recent analyses of magnetic and ionospheric data, notably by A. P. Nikolski, have resulted in spiral "precipitation" patterns which lead the authors to claim support for Störmer's theory of the aurora. Although it may be possible to argue against these claims by attacking the methods of analysis and/or the Störmer theory itself, an entirely different approach is used in the paper presented here: an examination of pertinent points of Störmer's theory shows that the analytical spirals mentioned cannot be Störmer spirals and this conclusion holds regardless of the soundness of the analyses and, indeed, of the validity of Störmer's theory. *Subject Headings:* **1. Auroral theories 2. Störmer's theory of auroras 3. Spiral patterns.**—*Author's abstract.* Ⓢ

12.8–167 535.242:551.594.51

Dzhordzhio, N. V., **Fotoelektricheskie nabliudeniia pul'siruiushchikh form poliarnykh siianii.** [Photoelectric observation of pulsating auroras.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizicheskaia*, No. 5:714–719, May **1960.** 6 figs., 2 tables, 5 refs. Transl. into English in the corresponding number of its *Izvestiia, Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DWB, DLC**—Observations on pulsating forms of polar auroras were made simultaneously with the aid of three photometers: two with antimony-cesium photomultipliers and one with a besmuth-silver-cesium multiplier having a greater boundary of red sensitivity. A photograph of the photometers and graphs showing the passage of emissions through interference filters as a function of type of polar auroral emissions, variation of intensities λ 3914 and 5577 Å in pulsating patches, determination of the retardation of λ 5677 Å from λ 3914 Å, etc., are presented. The emission λ 6300 Å during pulsating types of polar auroras alters very gradually. . The variations of emission intensity λ 5577 in PS in contrast to λ 3914 Å is more even and smoother without sudden emissions. The maximum values of time and life of the conditions 'S[OI] and 'D[OH] agree with the calculation of Gerstang. *Subject Headings:* **. Polar auroras 2. Photometers 3. Photoelectrical observation methods 4. Pulsating uroras.**—*I.L.D.* Ⓢ

12.8–168 551.510.535:551.510.62:551.594.5:550.385.37

†Campbell, Wallace H. and Leinbach, H. (*both, Univ. of Alaska*), **Ionospheric absorption t times of auroral and magnetic pulsations.** *Journal of Geophysical Research*, Wash., D. C., 6(1):25–34, Jan. **1961.** 9 figs., table, 27 refs. **DLC**—A study in March and April, 1960, howed variations in the auroral zone ionospheric absorption of cosmic noise to be closely

related to magnetic field micropulsations and short period coruscations of λ 3914. At times of polar-cap type absorption, magnetic micropulsation amplitudes were diminished. Auroral ionization in the E region, estimated from a particular luminosity-height profile, accounted for 50%, at least, of the cosmic noise absorption. *Subject Headings:* **1. Ionospheric absorption 2. Auroral ionization in E region 3. Cosmic noise absorption.**—*Authors' abstract.* Ⓢ

12.8–169 551.594.5

Gadsden, M. and Loughnan, C. J. (*both, Awarua Radio, New Zealand*), **Observations of non-field-aligned auroral rays.** *Journal of Atmospheric and Terrestrial Physics*, London, 18(4):332–335, Aug. **1960.** 3 figs., table, 4 refs. **DLC**—The phenomenon of non-field-aligned auroral rays is described. Of fifteen photographs taken at the St. Andrews Observatory of Scotland, five showed an auroral ray of unusual appearance. These rays were inclined at a particular angle and were red from top to bottom. The color of the rays shows that they were at considerable height in the atmosphere and that may be the reason for departure from the field alignment. Until further investigations are made it is difficult to speculate on their origin. *Subject Headings:* **1. Auroral rays 2. St. Andrews Observatory, Scotland.**—*A.H.K.* Ⓢ

D4. VAN ALLEN BELT

See: **Mirror and azimuthal drift frequencies for geomagnetically trapped particles** (Hamlin, Karplus), 12.8–161; **Latitude and altitude distribution of geomagnetically trapped protons** (Singer), 12.8–163.

12.8–170 550.38:538.69:551.521.64

Obayashi, Tatsuzo (*Radio Res. Lab. Kokubunji, Tokyo, Japan*), **Physical state of outer atmosphere and the origin of radiation belts.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 821–827. 2 figs., 10 refs., 4 eqs. Russian summary p. 821. **DWB** (523.1 161sp)—A possible mechanism trapping high energy particles in the radiation belts surrounding the earth is proposed, taking into account the existing hydromagnetic waves in the outer atmosphere. It is shown that there are two regions where the amplitude of hydromagnetic waves and the compressibility of gas bearing magnetic field are large. Since the acceleration mechanism is operative in such regions, particles inside the regions may be raised in their energies, and consequently they produce local inhomogeneities of hot plasma. These hot plasma interact with the geomagnetic field and may form a certain kind of magnetic bottles, in which the high energy particles are likely trapped more firmly. The inner activated region is expected at the height 1000∼3000 km and the outer region is of the order of 20,000 km. Although the origin of high energy particles is possibly of injected solar particles, their concentration at particular regions may be controlled considerably by the hydromagnetic nature in the outer atmosphere. *Subject Headings:* **1. Van Allen radiation belts 2. Radiation belt origin.**—*Author's abstract.* Ⓢ

12.8–171 551.507.362.2:551.521.64

Rosen, Alan; Farley, T. A. and Sonett, C. P. (*all, Space Tech. Lab. Los Angeles, Calif.*), **Soft radiation measurements on Explorer VI Earth satellite.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 938–950. 8 figs., 7 refs. Russian summary p. 938. **DWB** (523.1 161sp)—Electrons above 200 *keV* and protons above 2 *MeV* at radial distances of 6600 to 48800 km have been measured with a scintillation counter mounted in the Explorer VI Earth satellite. The spatial distribution of trapped radiation in the Van Allen zones is presented by means of an isointensity plot, curves showing variations with radial distance at constant geomagnetic latitude, and curves showing variations with geomagnetic latitude at constant radial distance. A charged particle flux in excess of 10^8 particles/cm^2 sec has been observed in regions of high intensity near the geomagnetic equator. Both daily fluctuations and sharp short term variations in the radiation flux have been observed in the outer Van Allen region. The fluctuations are discussed in terms of magnetic storms and solar activity and certain theoretical mechanisms for the variations are mentioned. *Subject Headings:* **1. Satellite radiation measurement 2. Van Allen belts 3. Trapped radiation distribution.**—*Authors' abstract.* Ⓢ

12.8–172 550.385.4:551.521.64

†Singer, S. Fred (*Univ. Md., College Park, Md.*), **On the nature and origin of the Earth's radiation belts.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: Proceedings of the First Symposium.* Pub. **1960.** p. 797–820. 62 refs. Russian summary p. 797. **DWB** (523.1 161sp)—A brief historical introduction traces the ideas which led to the prediction and eventual discovery of geomagnetically trapped radiation. It is concluded that the cosmic ray neutron albedo accounts well for the inner belt. We derive the spatial distribution of high energy protons around the earth, including their dependence on altitude and latitude. The extension of the theory gives the energy spectrum of these protons which is also in good accord with observations. The motion of the trapped particles produces magnetic effects. Here again the theory is well supported by direct observations carried out in the Lunik I rocket. Finally, we discuss the relation of geomagnetically trapped radiation to magnetic storms. *Subject Headings:* **1. Van Allen belts 2. Radiation belt origin.**—*Author's abstract.* Ⓢ

E. SOLID EARTH GEOPHYSICS

E1. GENERAL GEOPHYSICS

See also: **Physics of earth's interior** (Haalck), 12.8–9; **Earth science** (Namowitz), 12.8–29.

12.8–173 551.525.4:550.361.4

*Horai, Ki-iti (*Grad. School, Univ. Tokyo*), **Studies of the thermal state of the earth, Pt. 3, Terrestrial heat flow at Hitachi, Ibaraki Prefecture, Japan.** *Tokyo. Univ. Earthquake Research Institute, Bulletin,* 37(4):571–592, Dec. **1959.** 12 figs., 6 tables, 9 foot refs., 9 eqs. English summary p. 571. Japanese summary p. 592. **DWB, DLC**—From 68 measurements of rock temperature made at various points in drifts in Hitachi copper mine, geothermal gradients at these places were determined. The thermal gradient was found to be 0.94×10^{-2}° C/m and 1.21×10^{-2}°C/m in the north and the south parts of the mine respectively. Thermal conductivity of 36 rock specimens collected from various parts of the mine was measured using the divided-bar method. Apparent thermal conductivities of the rocks at the two parts are $6.73\sim7.08\times10^{-3}$ cal/cm sec°C and $6.50\sim7.43\times10^{-3}$ cal/cm sec°C. The terrestrial heat flow from the interior to the surface of the earth was computed to be $0.63\sim0.67\times10^{-6}$ cal/cm² sec for the north part and $0.78\sim0.90\times10^{-6}$ cal/cm² sec for the south part. These values are a little smaller than those already found in Japan. *Subject Headings:* **1. Geothermal gradients 2. Terrestrial heat flow computation 3. Hitachi, Ibaraki Prefecture, Japan.**—*Author's abstract.*

12.8–174 550.361.4

†Rikitake, Tsuneji (*Earthquake Research Inst.*), and Horai, Ki-iti (*Graduate School, Univ. of Tokyo*), **Studies of the thermal state of the earth, Pt. 4, Terrestrial heat flows related to possible geophysical events.** *Tokyo. Univ. Earthquake Research Institute, Bulletin,* 38(3): 403–419, Sept. **1960.** 5 figs., 4 tables, 39 foot-refs., 33 eqs. English summary p. 403. **DWB, DLC**—A subcrustal convection current having a linear dimension of a few thousand kilometers accounts for the high heat flows found on the East Pacific Rise provided a velocity of several cm/year and 1°C/km temperature gradient are assumed in the earth's mantle. A long-lived magma of high temperature and a phase transformation layer can give rise to only a fraction of the world average of heat flow for conceivable cases. In general, it is difficult to presume what sort of geophysical events are prevailing in the earth only from the observed heat flow anomalies. *Subject Headings:* **1. Terrestrial heat flow 2. Convection currents 3. East Pacific Rise, Pacific Ocean.**—*Authors' abstract.*

12.8–175 550.361:551.525.4

Uyeda, Seiya, (*Earthquake Research Institute*) and Horai, Ki-iti (*Graduate School, Univ. of Tokyo*), **Studies of the thermal state of the earth, Pt. 6, terrestrial heat flow at Innai Oil Field, Akita Prefecture and at three localities in Kanto-District, Japan.** *Tokyo. Univ. Earthquake Research Institute, Bulletin,* 421–436, Sept. **1960.** 9 figs., 4 tables, 10 foot-refs.,

3 eqs. English summary p. 421. **DWB**—Values of terrestrial heat flow have been determined at four localities in Honshu, the main island of Japan, for deep wells penetrating sedimentary layers. The sedimentary strata being saturated with water in situ, thermal conductivity of the cores was measured in the saturated state. The heat flow values are, each in the unit of 10^{-6} cal/cm² sec, 1.49 at Innai Oil Field, Akita Prefecture, 0.74 at Tokyo University, Tokyo, 0.76 at Kashima, Ibaraki Pref. and 0.91 at Katsuta, Ibaraki Pref. As far as the eastern part of Japan is concerned, the data so far obtained seem to suggest that the heat flow is smaller on the Pacific coast side than inland and on the Japan Sea side. Repeated temperature measurements in the wells at Kashima and Katsuta showed that the temperature data obtained immediately after the end of boring are not correct except near the bottom. *Subject Headings:* **1. Terrestrial heat flow 2. Honshu, Japan.**—*Authors' abstract.*

12.8–176 550.361

Shneiderov, A. J., **On the temperature of the earth's mantle-core boundary.** *Bollettino di Geofisica, Teorica ed Applicata*, Trieste, 2(8):647–649, Dec. **1960.** 11 refs., 5 eqs. English and Italian summaries p. 647.—A mantle-core boundary—the plutosphere of the Earth's core—is assumed to be gaseous and a minimum theoretical temperature of 1800°K derived for it from the equilibrium state between the weight of the mantle and the gaseous pressure in the plutosphere for the given density $Q=9.4$ g per cm³, and the mean atomic weight $\mu=1.008$. The approximate temperatures for atomic weights 2, 3, and 4.7 are found to be 3600°, 5400°, and 8500° respectively. The mantle-core boundary temperatures for the same molecular weight in a contracting Earth should be lower, and for the expanding Earth, higher than the above given temperatures determined for a static model of the Earth. A method is proposed for determining whether the Earth expands or contracts. *Subject Headings:* **1. Mantle-core boundary temperatures 2. Plutosphere of Earth's core.**—*Author's abstract.*

E2. GEODESY

12.8–177 551.507.362.2:521.312:525.14

O'Keefe, J. A.; Eckels, Ann and Squires, R. K. (*all, Natl. Aeronautics and Space Admin.*), **Earth's shape.** *American Geophysical Union, Transactions*, 40(2):172–173, June **1959.** 2 figs. **DWB, DLC**—This report is based on material prepared for publication in Science (*see* 11.12–189, Dec. 1960, *Met. Abs.*). Studies of variations in the orbit of 1958 Beta (Vanguard I) suggest that the traditional concept of the earth as a spheroid must be slightly modified. Calculations show that periodic variations in the orbit of 1958 Beta can be explained by a third zonal harmonic in the earth's gravitational field. Establishment of its existence requires slight modification of the geoid toward the shape of a pear, with the stem end up, i.e., at the North Pole. The presence of a third zonal harmonic of this large amplitude indicates a very substantial force acting on the surface of the earth. Following the methods of JEFFREYS, this crustal load is calculated to be 2×10^7 dynes/cm². Either stresses of approximately this order of magnitude exist down to the core of the earth, or stresses about four times as great exist in the uppermost 700 km only. These stresses must be supported either by a mechanical strength greater than usually assumed for the interior of the earth, or by large-scale convection currents in the earth's mantle. *Subject Headings:* **1. Earth figure 2. Satellite orbits 3. U. S. satellite, 1958 Beta (Vanguard I).**—*E.Z.S.*

12.8–178 539.1.08:525.35

Bryzzhev, L. D.; Leikin, A. Ia. and Sopen'nikov, M. D., **Opredelenie chastoty molekuliarnogo generatora i neravnomernosti vo vrashchenii Zemli.** [A determination of the frequency of a molecular generator and the irregularities of the earth's rotation.] *Astronomicheskii Zhurnal*, Moscow, 37(3):579–583, May/June **1960.** 3 figs., 5 refs. Russian and English summaries p. 579. **DLC.** Translated into English in *Soviet Astronomy AJ*, New York, 4(3):549–553, Nov.–Dec., **1960.**—The results of the determination of frequency of a molecular generator in systems of astronomical time *UT*-1 and *UT*-2 are described. A preliminary value of the frequency of the molecular generator equal to 23870 129.395±0.013 kc/s, is given. Data on the irregularities of the earth's rotation in 1958 were obtained from the determination of the frequency of the molecular generator in astronomical systems of time. It was found that

the amplitude and phase of the seasonal irregularities of the earth's rotation in 1958 are practically the same as those in 1955–1956, the latter being obtained by means of a caesium standard. *Subject Headings:* **1. Rotation of the earth 2. Molecular generators.**—*Authors' abstract.*

E3. VOLCANOLOGY

12.8–179 550.341:551.24

Uffen, Robert J. (*Dept. of Geophys., U. of Western Ontario*), **On the origin of rock magma.** *Journal of Geophysical Research*, Wash., D. C., 64(1):117–122, Jan. **1959.** 5 figs., 2 tables, 17 refs. **DLC**—The remarkable correlation between the locations of ocean trenches, eugeosynclines, gravity anomalies, volcanic islands, and earthquake foci suggests a common origin. These phenomena are frequently interpreted as being due to compressive failure of the outermost crust of the earth. Yoder's (1952) hypothesis has been extended to include remelting upon release of pressure during compressive failure rather than tensile failure. The range of mean pressure and the corresponding melting ranges for likely constituents of the crust and mantle, have been estimated. This hypothesis of magma generation is quantitatively feasible, but the data, especially the actual temperature distribution, are at present inadequately known. *Subject Headings:* **1. Origin of magma 2. Magma generation.**—*Author's abstract.*

12.8–180 551.510.7:539.16:551.217

Vittozzi, Pio and de Martino, M., **Analisi radioattiva delle lave vesuviane col metodo dei fotomoltiplicatori.** [Radioactive analysis of Vesuvius lava by the use of scintillation counters.] *Associazione Geofisica Italiana, 7th Rome, Nov.* 1957, *Atti*, pub. Rome, (**1958**?). p. 95–98. fig., 4 eqs. Italian and English summaries p. 98—Techniques used in observations with super sensitive instruments to check quantitatively and qualitatively any trace of radioactive substance in the lava deposits of 1944 from Vesuvius are discussed here. *Subject Headings:* **1. Radioactive lava 2. Mt. Vesuvius, Italy.**—*W.N.*

12.8–181 551.21:550.342

Sekiya, H. (*Karuizawa Weather Station, Japan*), **An analysis of volcanic activity of Mt. Asama, Pt. 2, On volcanic activity in 1958.** *Japan. Meteorological Agency, Quarterly Journal of Seismology*, 24(2):91–101, March **1960.** 8 figs., 10 tables, 4 refs., 5 photos. In Japanese; English summary p. 91.—Various observations such as volcanic earthquake, quantity of smoke and state of crater, etc. have been continuously carried out since 1923 at the Oiwake Volcano Observatory which is located 7.6 km S.S.E. of the summit crater and at the Karuizawa Weather Station which is located 9.1 km S.E. of the crater. Observations have been made mainly by Ishimoto's seismograph with magnification about 3,500 at Oiwake since August 1957. After the explosion of June 11, 1955, Volcano Asama was rather calm till Feb. 1958. Since the middle of March, however, micro-earthquakes of the Type A have occurred in swarms from time to time (Type A is considered to be a volcanic quake, duration of its preliminary tremor is clearly observed). In the latter half of July, 1958, duration of preliminary tremor of Type A micro-earthquakes observed at Oiwake Volcano Observatory became 1.3∼1.5 seconds, and the number of micro-volcanic tremor of the Type B near the crater increased, while at the same time the rumblings were heard near the crater and the quantity of smoke increased. We warned the people at the foot of the volcano against the coming volcanic explosions. On October 10, 1958, a slight eruption broke out and a small amount of ash was emitted. After that, through-out the activity, we observed not only markedly frequent earthquakes with larger amplitude, but also a series of volcanic tremors of which periods were 0.8∼1.5 sec. Mt. Asama erupted very frequently. At 22 h 50 m 28.6 s on Nov. 10, 1958, a great explosion broke out and a great deal of volcanic products was emitted and the kinetic energy of the explosion was estimated at about 7×10^{19} ergs. However no persons were directly injured by the explosion, since the explosion had been predicted early in September. Since then explosions of moderate intensity have been taking place intermittently with mean intervals of 9∼14 days. *Subject Headings:* **1. Volcanic activity 2. Mt. Asama, Japan.**—*Author's abstract.*

12.8–182 551.21

Chaigneau, Marcel; Tazieff, H. and Fabre, R., **Composition des gaz volcaniques du lac de lave permanent du Nyiragongo (Congo belge).** [Composition of the volcanic gases from the

permanent lake of lava of the Nyiragongo (Belgian Congo).] *Académie des Sciences, Paris, Comptes rendus*, 250(14):2482–2485, April 4, 1960. table, 9 refs. **DWB, DLC**—An expedition in 1959 of the Belgian National Center for Volcanology sampled the gases of the permanent lake of lava on the Nyiragongo Volcano. A short description of the sampling technique is given. The results of the analyses emphasize particularly the following facts: constant presence of carbon dioxide at a particularly high concentration, contents of 2.9 to 7.85% sulphur dioxide, of 0.95 to 2.15% hydrogen; the constant absence of methane and practically of hydrogen sulphide; contents in rare gases almost the same as in atmospheric air. Examining these results confirms that the use of a quick acting dehydratant (P_2O_2) avoids certain interactions. *Subject Headings:* **1. Volcanic eruptions 2. Composition of volcanic gases 3. Nyiragongo Volcano, Belgian Congo.**—*A.V.*

12.8–183 551.241:551.214

Quiring, Heinrich (*Berlin*), **Rindenmächtigkeit und Entstehung der Tiefseegräben und Vulkane des Nordpazifik.** [Thickness of the crust and formation of deep sea trenches and volcanoes in the North Pacific.] *Forschungen und Fortschritte*, Berlin, 34(6):164–167, June 1960. 3 figs., 16 refs. **DLC**—The author's interpretations do not seem to agree with many of those made following the successful descent on the Marianas trench. He questions the idea that the earth's crust is thicker under the deep sea than it is under the continents and their shelves. Schematic profiles through the Japan and Marianas trench are included to illustrate his interpretations. He reviews some of his previous work explaining the volcanic activities in the northern Pacific and his ideas concerning the origin of the moon. It is noted that analogous ideas have been used since 1957 by both the U. S. and the Soviet satellite experts concerned with the acceleration of their satellites. A map of the North Pacific shows the topographic features of the basin and the author's conception of the location of the scar left by the moon. *Subject Headings:* **1. Sea bottom topography 2. Moon's genesis 3. Earth's crustal thickness 4. North Pacific Ocean.**—*E.Z.S.*

E4. SEISMOLOGY

12.8–184 550.340.63

Shlanger, Ari B. M. (*Seismological Lab., Pasadena, Calif.*), **Some consequences of earthquake statistics for the years 1918–1955.** *Beiträge zur Geophysik*, Leipzig, 69(2):68–72, 1960. 2 figs., table, 15 refs., 4 eqs. English and German summaries p. 68. **DWB, DLC**—The time-interval distribution of more than 650 earthquakes with magnitude of seven and above is studied in search of trends. It is shown that the fit to the Poisson distribution is such as to exclude the possibility that major earthquake occurrence is being influenced by any dominating external force. This result then serves to obtain the probability distribution of earthquakes in time. *Subject Headings:* **1. Earthquake probability distribution 2. Earthquake statistics.** —*Author's abstract.*

12.8–185 550.341.7(5)

†Öcal, Nevzat (*Kandilli Obs., Istanbul*), **Die Dispersion von Oberflächenwellen im asiatischen Kontinent.** [Dispersion of surface waves in Asia.] *Beiträge zur Geophysik*, Leipzig, 69(1):35–56, 1960. 9 figs., 6 tables, 27 refs., 9 eqs. German and English summaries p. 35–36. **DWB, DLC**—Using seismograms of the station Kandilli-Istanbul, Turkey, the dispersion of Love and Rayleigh waves passing the Asiatic continent is discussed. 146 dispersion curves of Love waves have been computed by formulas and nomograms of Sato to study the influence of the thickness of a surface layer and of the physical parameters; the same was done for Rayleigh waves. The approximation of the experimental dispersion curves by suitable theoretical dispersion curves yields certain values of the above parameters for the Asiatic content. Love and Rayleigh waves provide different thickness of the surface layer and velocity of transversal waves in this layer. The proportion of this velocity to that of the semi-infinite medium below the layer and the proportion of rigidity modulus of the semi-infinite medium and the layer prove different in both cases. The results are discussed and compared with those of other authors. *Subject Headings:* **1. Earthquake surface waves 2. Asia.**—*Author's abstract.*

12.8–186 550.341

Groubé, W., **Le tremblement de terre d'Agadir.** [The earthquake at Agadir.] *L'Astronomie*, Paris, 74(4):187–188, April 1960. **DLC, NNC, DWB**—The earthquake which on Feb. 29, 1960 destroyed 80% of the town of Agadir, Morocco, was responsible for 7000 persons killed or missing. This disaster was part of a series of more or less violent seisms felt in North Africa during the last decade of Feb. 1960. According to seismological observations, the geographical coordinates of the epicenter of the seism at Agadir were as follows: $y = +30°30'$ and $L = 9°42'$W. It was centered offshore at about twenty kms west of the town on an already known axis of seismic instability. This geological situation accounted for the intensity of this earthquake which reached 10 degrees on the international scale. The quake lasted for 45 min. 15 sec. and the tremors which provoked the disaster lasted for about 10 sec. The tide-race can be explained by a local raising of the sea bottom; at a given place only 13 m instead of 350 m were recorded. *Subject Headings:* **1. Earthquake, Feb. 1960 2. Agadir, Morocco.**—*A. V.*

12.8–187 550.341.2(235.21)

Khovanova, R. I., **Spektry deĭstviia nekotorykh zemletriaseniĭ Narynskoĭ zony Tian'-Shania.** [Activity spectra of certain earthquakes in the Naryn region of the Tien Shan.] *Akademiia Nauk SSSR. Institut Fiziki Zemli, Trudy*, No. 5(172):114–125, 1959. 5 figs., table, 3 refs. **DLC**—Recordings of earthquakes in the Narynsk district of Tien Shan are used to establish an activity spectra in accordance with the "modulated sinusoid" method suggested by S. V. Medvedev. The distribution of epicenters is shown on a map of the district. The relationship between the force of earthquakes (intensity and magnitude), its epicentral distance and the activity spectra are examined. *Subject Headings:* **1. Earthquake data 2. Earthquake spectra 3. Naryn region, Tien Shan, Asiatic U.S.S.R.**—*E.Z.S.*

E5. TECTONICS

See also: **Thickness of the crust and formation of deep sea trenches and volcanoes, N. Pacific** (Quiring), 12.8–183.

F. OCEANOGRAPHY

F1. OCEANOGRAPHY

See also: **Eastern Mediterranean Foraminifera** (Parker), 12.8–24; **Biol. of southern cold temp. zone** (Pantin), 12.8–53; **Hydrographic bibliogs.**, 12.8–66; **Influence of sea surface temp. on temp. of Peruvian coast** (Valle Espejo), 12.8–84; **Thickness of the crust and formation of deep sea trenches and volcanoes, N. Pacific** (Quiring), 12.8–183; **Temp. and salinity measurements, Kiel Harbor** (Ohl), 12.8–329; **Meteorological conditions near the sea surface at Tango Pt. 2, Japan,** (Ogata et al.), 12.8–388; **Meteorological conditions near the sea surface at Tango, Pt. 3, Japan** (Ogata et al.), 12.8–389; **Meteorological condition near sea surface at Tango, Pt. 4, Japan** (Ogata), 12.8–390.

12.8–188 91.04(99) 551.46(267)

Moroshkin, K. V., **Gidrologicheskie issledovaniia.** [Hydrological investigations.] *Sovetskaia Antarkticheskaia Ekspeditsiia*, 1955–, [*Materialy*], Vol. 5, issued Leningrad 1959. p. 106–123. 12 figs., 2 tables. **DLC**—The First Marine Expedition conducted hydrological investigations in the eastern part of the Indian Ocean from the Shackleton Glacier of the Antarctic to Balleny Island. The Second Expedition investigated the western part of the Indian Ocean from the same place in the Antarctic to Princess Ragnhild Coast (20°E long). Number and types of the hydrological instruments used by the Expedition are given in the text. Measurements of temperature and salinity and water sampling were made on full depth with different standard intervals of the depth (25, 50, 100 and 500 m). Current velocity and direction were determined while the ship was adrift and total drift was measured with respect to assumed zero level at a depth of 1,000 m. Water temperatures were measured by the electrothermometer (CT-55) with automatic recording potentiometer (EPP-09), the reading of which was regularly checked against the mercury thermometer. Complete hydrological data

at various depths and directions were obtained on 178 stations (stops) and plotted on 11 charts (cross sections), including charts on temperature and salinity distribution on various depths on eastern part of the Indian Ocean from Shackleton Glacier to the shore of the Bay of Bengal. One chart on distribution of current velocity and direction between the Antarctic and African shore and two charts on distribution of relative temperature on the isopycnic (constant surface of $6x = 27.80$) and topography of the isopycnic surface ($6x = 27.80$) between the Antarctic and African shore are given. *Subject Headings:* **1. Hydrological investigations 2. Oceanographic investigations 3. Indian Ocean.**—*N.P.S.*

12.8–189 525.623:551.482.2(282.247)

Krivosheeva, I. T., **Issledovanie sgonnykh i nagonnykh urovneĭ na Nizhnem Dnepre.** [Investigations of tide levels in the lower Dnieper River.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, 3rd Oct.* 1957, *Trudy*, Vol. 7, issued **1959.** p. 268–274. fig., 2 tables, 5 refs. **DWB** (M79 V985tr)—The lower reaches of the Dnieper River are subject to tidal stage variations. The average variation is 0.20–0.30 m, maximum was 1.67 m. The phenomenon is a result of several causes, the most important of which is high wind velocity. Average annual wind velocity over the river and its mouth is 4.3–5.3 m per sec. A detailed statistical and physical analysis of 101 flood and 95 ebb-tides is given. The method of A. V. KARAUSHEV is used to draw nomograms which permit the forecasting of curves of free level of water in the region, depending on the river discharge, geographical direction and velocity of wind. *Subject Headings:* **1. River level calculations 2. Tidal fluctuations 3. Dnieper River, U.S.S.R.**—*J. Němec.*

12.8–190 551.556.8:551.465(262.5)

Belinskiĭ, N. A. and Glagoleva, M. G., **Metod izucheniia i raschetov neperiodicheskikh techeniĭ v more.** [A method of studying and calculating aperiodic sea currents.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:18–25, March **1960.** 2 figs., 12 refs. **DWB, DLC**—Generalization on numerous observations of sea currents and correlation with winds are discussed, with a review of works of other investigators given in 12 references. Periodical variations of the currents can be comparatively easily determined and related to the tide phenomenon. However, most variations are caused by winds of different directions and intensities. Therefore, the problem of the generalization of observed data of the aperiodic current variations can be related to two basic questions: (1) to establish the wind conditions in relation to time and space (place) and (2) to establish a relation of the current and wind. These questions are the main subject of the author's discussion and analysis with the use of the Ekman's theory of drifting and gradient currents and also the use of so-called "wind coefficients." In view of general complexity between the wind pressure and current the problem can be arbitrarily limited to certain simple conditions, related to a few concrete patterns of relationship, which can be analyzed with a series of Chebyshev polynomials. The patterns can be related to the western-eastern or eastern-western air streams or to air movement along the meridians or to the cyclonic and anticyclonic system, etc. In connection with these problems an Interdepartmental expedition was formed for the study of the Black and Azov Sea currents. Many oceanographic, meteorological and other scientific research institutions participated in this expedition. The observations were made from many shore and ship stations and also from special floats with automatic recording devices. In analyzing the pressure fields with Chebyshev polynomials only the first six coefficients are used for the quantitative characteristics of the baric field above the sea. The coefficient (A_{00}) represents the mean deviation of atmospheric pressure above the sea to 1010 mb. The coefficients (A_{01}) and (A_{02}) define the stream of air along the parallel (west to east or east to west), the coefficients (A_{10}) and (A_{20}) indicate the meridional movements of air and the coefficient (A_{11}) indicates the convergence and divergence of the air streams. Correlations of these coefficients were obtained for the local positions and illustrated on 6 graphs and final relation of the baric field is illustrated in the 7th graph. *Subject Headings:* **1. Sea current calculations 2. Wind effects on currents 3. Black Sea 4. Sea of Azov.**—*N.P.S.*

12.8–191 551.556.8:551.465(261.3)

*Morozov, A. P., **Techeniia u Libavskogo plavuchego maiaka.** [Currents around Libau (Liepaia) lightship.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No.

41:46–53, 1957. 4 figs., 6 tables, eq. **DLC**—The system of steady currents in a counter clockwise direction is considered for the Baltic Sea as the results of predominant winds, land water runoff, character of coastal relief, water exchange between the Baltic and North Seas and other factors. General observations of the current were conducted from 1892 to 1914 and specific data of 2800 observations secured from 1900 to 1908 were selected for analysis and coordinated into groups of the same direction as the wind. The vectors of each group were analyzed according to meridians and parallels and were algebraically summed up for determination of the resultant vectors of current and for further mathematical analysis and tabulation of results and correlation with the wind direction. The analysis also includes the determination of wind coefficients (ratio of wind velocity to current velocity) and their directional distribution on the wind "rose" diagram. *Subject Headings:* **1. Sea currents 2. Baltic Sea.**—*N.P.S.*

12.8–192 551.556.8:532.593:551.465

Gershengorn, G. I., **O nekotorykh osobennostiakh neustanovivshegosia vetrovogo volneniia v glubokom more.** [Some properties of unstabilized wind wave activity in a deep sea.] *Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 7:3–9, **1959.** 3 figs., 9 refs., 28 eqs. **DWB**—The equation of energy balance for a deep sea, $\frac{\partial E}{\partial t}+\frac{\partial A}{\partial x}=M-D$ is, for the condition of a homogeneous wind flow, constant wind direction and infinite fetch reduced to $\partial E/\partial t=M-D$ where t = time, E = mean energy of waves for unit sea surface, A = mean flow of energy in the direction of wave propagation, M = mean force transmitted to the waves by the wind for unit sea surface. D = mean value of wave energy dissipated in a column of water of unit base in unit time; E is associated with wave height by $E=(3\pi g\rho/128)h^2$ (g = acceleration of gravity, ρ = density of sea water, h = height of waves at a point averaged for a small time interval). It is shown that the energy balance equation for $\partial A/\partial x=0$ is reduced to a differential equation which is linear relative to the mean height of the wave, namely $\partial h^2/\partial t+\beta h^2=\beta F(t)$ where F is any function determined from data of wave height and β = and empirical coefficient equal to 0.14 hour. As a result of the solution of this equation namely $h^2=h_0{}^2e^{-\beta t}+\beta\int_0^t F(t-\tau)e^{-\beta\tau}\,d\tau$ there are obtained relationships for heights of waves for winds varying with time in accordance with any law. Example of unstable sea lead to the following conclusions: 1) unstable sea prevails under natural conditions; the equation for unstable sea is satisfied only in their moments of time when the wave height attains maximum or minimum values; 2) the effect of preceding wind upon height subsides quickly; 3) the development of wind waves occurs more rapidly than the damping of swell; 4) strong wind relatively "beats down," the swell approaching a coast. *Subject Headings:* **1. Wind waves at sea 2. Ocean waves.**—*I.L.D.*

12.8–193 551.556.8:551.465

Lineĭkin, P. S., **O vliianii poverkhnosti razdela na vetrovye techeniia v glubokom more.** [Influence of the boundary surface on wind currents in a deep sea.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 42:89–104, **1958.** table, 2 refs., 70 eqs. **DLC**—In previous investigations of wind induced currents the effect of the nonuniform density of sea water was considered by averaging the vertical gradient of density with depth of a baroclinic sea. In this way it was possible to obtain by the methods of hydrodynamics, the principal laws of the formation of currents and of the distribution of density, agreeing qualitatively with the observed picture of processes in the sea. In this study the theoretical model of the processes studied is made more complete by the best approximation to the real stratification of density in the sea in order to obtain more accurate quantitative characteristics of established wind induced currents. From the equations of hydrodynamics and density diffusion, equations are derived for computing the gradient convective elements of velocity and distribution of density with depth, the wind effect upon the established wind currents, the structure of the current and density field in the surface layer, etc. *Subject Headings:* **1. Wind currents 2. Hydrodynamic equations 3. Density diffusion equations.**—*I.L.D.*

12.8–194 551.556.8:551.551:551.461.2

Vinogradova, O. P., **Tangentsial'noe napriazhenie vetra nad vzvolnovannoĭ morskoĭ poverkhnost'iu.** [Tangential wind stress above a turbulent sea surface.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1646–1655, Nov. **1959.** 6 figs., 2 tables, 4 refs., 9 eqs. Russian summary p. 1646. Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—Extensive studies of air turbulent processes above the ground have been made, but the author gives here special attention to the study of physics of the movements of the atmospheric layer above the sea surface. This condition is more complicated than above the ground processes, because the wave surface and shape are changing with wind velocity. The results of other investigators were reviewed and graphically coordinated with respect to relation of the surface friction coefficient and the wind velocity. The author's study was further concentrated on determination of the tangential friction of wind above the water surface. Two methods were used: (1) the measurements of the pulsating velocity with a thermo-anemometer and (2) the measurements of wind velocity gradients above the sea. The relation of the wind tangential stress and wind mean velocity was established by the statistical method of processing of the recorded data which is illustrated graphically. Also it was found that the friction coefficient increases with rising temperature of unstable atmosphere. The friction coefficient was found to be dependent upon the turbulence coefficient, as well as upon the thermal stratification of the atmosphere. All these relationships are illustrated on graphs. *Subject Headings:* **1. Atmospheric turbulence 2. Air-sea relationships 3. Tangential wind stress on sea surface.**—*N.P.S.*

12.8–195 551.556.8:551.465:532.59:551.42(262.8/.9)

Ovsiannikov, A. N., **Vetrovye volny u ostrova v otkrytom more.** [Wind waves at an island in the open sea.] *Meteorologiia i Gidrologiia*, No. 12:30–32, Dec. **1959.** 2 figs., 2 tables. **DWB, DLC**—The study of the behavior of waves passing an island in the open sea is described in view of special interest in harbor and other constructions on Svinoĭ Island of the Baku archipelago (Caspian Sea). The arrangement of the observation points around the island and method of recording direction and force of the waves are described with a table and a chart. The direction of the waves was always perpendicular to the shore, even on the side of the island opposite to the wind. The wave heights are recorded around the whole island and plotted on a special chart. The profile of the island and major erosion of the shore indicate the predominant direction of the winds. *Subject Headings:* **1. Wind waves 2. Wave erosion 3. Svinoi Island, Caspian Sea.**—*N.P.S.*

12.8–196 551.552:551.465(261.3)

*Soskin, I. M. and Denisov, V. V., **Raschet statsionarnoĭ gorizontal'noĭ tsirkuliatsii vod Baltiĭskogo moria dlia dvukh tipov poleĭ vetra.** [Calculation of the stationary horizontal water circulation in the Baltic Sea for two types of wind fields.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 41:31–45, **1957.** 5 figs., 2 tables, 8 refs., 11 eqs. **DLC** - In view of small current existing in the Baltic Sea, observable with difficulties, the theoretical method is developed supplementing the methods described in given references. In this method the ratio $(-\mathrm{rot}\cdot T/H)$ of a vertical component of tangential pressure of the turbulent wind $(-\mathrm{rot}\cdot T)$ to sea depth (H) is used for computation of water movement. Practical use of this method is described with detail and with two maps of the Baltic Sea, which is affected by strong western and eastern winds. The changes in temperature, salinity and density of water before and after these winds are studied and recorded on the graphs, maps for wind field and isolines $(-\mathrm{rot}\cdot T/H)$. Observed local water circulation interfering with general circulation in the Baltic Sea are analyzed with mathematic equations related to studies of other investigators (Kort, Heiman, Felzenbaum and others listed in references). This investigation includes two types of wind fields illustrated on four maps. The evaluation of the results of this investigation is summarized in the text with tabulated data. *Subject Headings:* **1. Wind driven ocean circulation 2. Baltic Sea.**—*N.P.S.*

12.8–197 551.556.8:551.465(261.2,261.3)

*Soskin, I. M. and Rozova, L. V., **Vodoobmen mezhdu Baltiĭskim i Severnym moriami.** [Water exchange between the Baltic and North Seas.] *Moscow. Gosudarstvennyĭ Okeano-*

graficheskiĭ Institut, Trudy, No. 41:9–30, **1957.** 9 figs., 3 tables, 16 refs., 12 eqs. **DLC**—The results of studies of fluctuation of water exchange through the Danish strait, connecting the Baltic and North Seas are described in detail with map, charts and tables. The author describes basic regularities and irregularities in water circulation in the Danish Strait, related to the water exchange. The observed changes in water flow are considerably affected by variable wind and weather conditions. Some observed variations were related to a period of one year, to specific temperature and direction of wind. The method of computation of the water exchange and analysis of results are outlined with mathematical formulas and separate graphs for incoming and outgoing flow. Monthly and mean annual variations in the water exchange are computed, tabulated and plotted on the graphs from 1898 to 1944 and correlated with water levels of the Baltic Sea and Cattegat Strait for a corresponding time. Special attention is given to long range (1898–1944) fluctuation in water exchange between Baltic and North Seas, computed on average annual data for incoming and outgoing water and for water exchange. The results were plotted on a yearly basis and integrated also for 5 yr periods. *Subject Headings:* **1. Water exchange Baltic and North Sea 2. Circulation between Baltic and North Sea.**—*N.P.S.*

F2. HYDROLOGY

See also: **Fundamentals of hydrogeology** (Bogomolov), 12.8–10; **Development of hydrol., Russia** (Fedoseev), 12.8–13; **Water** (Davis, Day), 12.8–32; **Water table as affected by atmos. pressure** (Peck), 12.8–333; **Harmonic analysis of precip. series with application to rainfall forecasting in hydroelec. basins** (Mosetti), 12.8–365; **Estimating maximum possible precip., Calif.**, 12.8–368.

12.8–198 551.577:551.573:551.579.5:633.2

van Duin, R. H. A. (*Cultuurtechnische Dienst*), **De berekening van de aanvullende waterbehoefte van grasland.** [Calculation of the need of water supply for grassland.] *Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek. Commissie voor Hydrologisch Onderzoek, Verslagen en Mededelingen*, No. 4:150–158, **1960.** 3 figs., table, eqs. English summary p. 150. **DWB**—To calculate the capacity of irrigation canals one should be informed in the first place on the water balance of the crop in the given area. This water balance consists of precipitation, soil moisture storage and need of water, of which the upper limit is determined by the potential evapotranspiration of the crop. Since dry and wet periods often alternate in such a way that for long periods a surplus of water is calculated, e.g. in the Netherlands this water balance should be set up for short periods. The influence of the length of these periods is represented in Fig. 1. In this paper the water balances of grass in the Netherlands are calculated for periods of ten days after which the surplusses and deficits are summed up separately during the growing period. The relation between the total moisture deficit during the growing period and the storage capacity of the soil has been given in Fig. 2. If this capacity equals zero the moisture deficit approaches the potential evapotranspiration, since in that case no rain becomes available to the crop. The influence of supply of water on the moisture deficit is represented in Fig. 3. It appears that the efficiency of water supply decreases with increasing capacity, since periods with a small water deficit more often occur than periods with a large deficit. A continuous supply with 10 mm of water during each ten days is used up for 75%, the second 10 mm for 45%, the third 10 mm for 25% and the fourth 10 mm only for 8%. Because of this a capacity of the irrigation canals of about 2.5 mm/day will be sufficient to supply a crop of grass in the Netherlands with water except for losses to the underground. *Subject Headings:* **1. Water supply for grasslands 2. Netherlands.**—*Author's abstract.*

12.8–199 551.501.4:551.573:551.579

Visser, W. C. and Bloeman, G. W. (*both, Inst. voor Cultuurtechniek en Waterhuishouding*) **De berekening van de verdamping uit de waterbalans.** [Determination of evaporation by means of the water balance.] *Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek. Commissie voor Hydrologisch Onderzoek, Verslagen en Mededelingen*, No. 4:126–142, **1960.** 7 figs., eqs. English summary p. 126–127. **DWB**—It is possible to determine evaporation from an analysis of the known readings of rain, evaporation and ground-

water depth by inserting these values in the terms of the water balance. For evaporation the analyses may only be tested by assumptions regarding the relations between the variables. The result, that rain increases the evaporation and that an increase in ground water depth decreases the evaporation, is obvious. Also, the fact that the balance terms fit as well the water balance, the formulas as far as they are known, as the curvi-linear relations with the observations, proves that from ground water depth and meteorological observations it is possible to obtain an insight into the water balance. This is possible everywhere, where during 3 years testwells are observed. The indirect determination of the evaporation is not as accurate as the direct measurements with lysimeters. It seems possible to increase the accuracy by improving the knowledge of the functions for the balance terms. Also measuring the flow potentials of the moisture stream in the capillary zone, in the plant and in the air, will improve the accuracy. Lastly, a mathematical curve-fitting technique will be valuable provided that the streamflow functions are known. It is, however, not expected that the accuracy will improve greatly. Certain situations in the soil are inherently indefinite, hysteresis for instance. The accuracy of the lysimeter will therefore be lost by transposing the results to other conditions. The prognosis of the evaporation from the analysis of the balance terms is, however, entirely set up with the purpose to transpose the results to other circumstances. A certain loss of accuracy is therefore acceptable. *Subject Headings:* **1. Evaporation calculations 2. Water balance calculations 3. Soil moisture 4. Netherlands.**—*From authors' abstract.*

12.8–200 551.579.4:551.455:551.437(282.247)

*Kharchenko, S. I., **Formirovanie vesennikh polovodiĭ v usloviiakh stepeĭ Nizhnego Dona.** [Formation of spring floods in the steppe region of the Lower Don.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy,* No. 71:5–35, **1959.** 10 figs., 16 tables, 15 refs., 5 eqs. **DLC**—The processes of formation of spring floods, in particular the high flood waters of 1956 observed on small rivers of the Lower Don Basin, are examined. Material obtained by the Dubova Experimental Hydrological Laboratory during the period 1949–1957 and data of the Northern Caucasian Hydrometeorological Service served as the basis of this study. With the aid of extensive data presented in tables and graphs and relevant formulas, the author discusses the following: the factors of spring runoff including snow cover, ice crust, precipitation during the high water period, intensity of snow melt, losses of melt water and maximum runoff. *Subject Headings:* **1. Runoff 2. Spring floods 3. Flood formation 4. Don River Basin, U.S.S.R.**—*I.L.D.*

12.8–201 551.579

Lambor, Julian, **O danych meteorologicznych potrzebnych hydrologom.** [On meteorological data needed by hydrologists.] *Przeglad Geofizyczny,* Warsaw, 4(2):121–126, **1959. DWB, DLC**—In spite of the obvious very close connection between meteorology and hydrology, there is often a lack of understanding of the mutual needs and of common language between meteorologists and hydrologists. The main questions put to meteorologists by hydrologists concern the following problems: 1. Warning of flood danger based on the knowledge of the flood producing situation; 2. the determination of the tendency of precipitation on the basis of cloud types, the nature of air, and the type of circulation; 3. the character of air masses described clearly by degrees of humidity according to an accepted scale; 4. a detailed determination of the situation of main precipitation centers and of the trend of their movement; 5. the organization of a network of observation and signal stations for the needs of the hydrological service, etc. *Subject Heading:* **1. Hydrology.**—*A.M.P.*

12.8–202 551.501.9:551.579:061.3

Hydrological networks and methods: Seminar in Bangkok. *World Meteorological Organization, WMO Bulletin,* 8(4):195–198, Oct. **1959.** 2 photos. **DWB**—A report of an international seminar on hydrological networks and methods, held at ECAFE headquarters in July 1959. The purpose of the seminar was to provide training in the design of hydrological networks and in hydrological methods which can be used in the absence of adequate basic data. The proceedings consisted of a series of lectures and practical demonstrations by world experts on the subject and discussions among the participants of papers describing recent work in their

own countries. *Subject Headings:* **1. Hydrological networks 2. Hydrological observation methods 3. Hydrologic seminars.**—*I.S.*

12.8–203 551.501:551.482:551.579.4

Nechaeva, N. S., **Naibolee rasprostranennye v SShA metody rascheta transformatsii voln pavodkov pri peremeshchenii po rechnomu ruslu.** [The methods most widely used in the U. S. for calculating the transformation of flood waves during their movement along a river channel.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 94:79–92, **1959.** 5 figs., 3 tables, 14 refs., 22 eqs. **DWB**—The author summarizes in detail the methods employed in the U. S. to calculate the unstable movement of water in a river channel on the basis of empirical estimates of channel volume. The essence of the methods of valuating empirically channel volume involves the simultaneous solution of the equation of continuity written in the form of

$$\frac{Q^{beg}_{inc}+Q^{fin}_{inc}}{2}\Delta t+W_{beg}-\frac{Q^{beg}_{dir}}{2}\Delta t=W_{fin}+\frac{Q^{fin}_{dir}}{2}\Delta t$$

and curve of volumes $W=f(Q_{inc}, Q_{dir})$. Depending upon the technique of computation, the methods of solution are of three types: (1) analytical, (2) semigraphic and (3) machine. The equations involved in each method are derived, the procedures and results of computation are presented and the mechanical integrater and its operation are described with the aid of a diagram. Also some recent developments in the Soviet union in the field of calculation of nonstationary movement of water are discussed. *Subject Heading:* **1. Channel flow calculations.** —*I.L.D.*

12.8–204 551.482.2:551.579.4:551.491

Il'iasov, A. T., **Gruntovoe regulirovanie stoka reki Naryn.** [Soil regulation of the runoff of the Naryn River.] *Meteorologiia i Gidrologiia*, Moscow, No. 11:45–47, Nov. **1959.** fig., table. **DWB, DLC**—The regulations of the flow of mountain rivers may be determined by the water exchange between river and underground waters as well as by mountain's climatic factors. Accordingly the author attempts to establish the phenomena of ground water regulation at individual sections of the Naryn River, the largest river in Kirgiz. The total flow of the river was divided into the "transit flow" of the channel formed by ground water regulation of the incoming flow of a given section and the flow of surface influxes. The magnitude of the transit flow is determined by subtracting the flow of all tributaries of the principal river, from its beginning to a given point, from the total flow measured at the lower point of a section. Analysis of the variability of the fundamental flow of the Naryn River leads to the conclusion that ground water regulation plays a large role in the flow of this river. This process varies for the same section of the river (in time) and for different sections (in space) both in direction and intensity. There was found a relationship between the nature of the regulation and the total volume of river flow. The degree of ground water regulation of flow can be characterized by the relationship of maximum and minimum mean monthly values of flow from a long period record since the water exchange between surface and underground waters leads to a smoothing out of fluctuations of water for large rivers. Data on the relationship of maximum to minimum long period mean monthly flow are presented. *Subject Headings:* **1. Ground water regulation 2. Naryn River, Kirgiz SSR.**—*I.L.D.*

12.8–205 551.509.58:551.579.4:551.482.2

*Semlianskaia, L. P., **K metodike prognoza pavodochnogo stoka na rekakh Primorskogo kraia.** [Methods of forecasting flood discharge for rivers of the Maritime Territory.] *Dal'nevostochnyĭ-Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 8:32–63, **1959.** figs., 8 tables, 3 charts, 12 refs., 6 eqs. **DWB**—The author investigates the laws of formation of rainfall runoff and the possibility of short range forecasting of this runoff on the basis of the method of M. I. Gurevich, which is based upon the genetic formula of runoff, the latter taking into account not only the runoff of precipitation in the channel systems but also the time distribution of the inflow of rain water into the channel systems. The study is based upon the data for the Iman River obtained by the Gogolevka station from 1936–1955; 52 floods of varying magnitudes and duration were examined. The contents of this study include the

following: physical geographic conditions in the formation of rainfall runoff of the Iman River evaluation of the observational data and survey of methods for forecasting rainfall runoff as function of precipitation; the law of depletion of water reserves in a basin; the general caus of depletion; distribution of influx in the channel system (partial cause of depletion); variabilit of the distribution of influx in the channel system and the computation as a function of th magnitude of flood water rise; computation of effective precipitation; calculation of guarantee runoff and determination of losses; analysis of the effect of losses; and forecasting the runo hydrograph on the basis of precipitation amounts. In addition to extensive numerical dat and graphs in the text, an appendix containing tables on the characteristics of rain floods on th Iman River at Gogolevka, daily observations of runoff at the Iman River at Gogolevka fo various flood periods, computations of the hydrograph of Iman River runoff at Gogolevka fo the period Aug. 24–Sept. 29, 1941, etc. is included. *Subject Headings:* **1. River discharg forecasting 2. Short range forecasting of runoff 3. Rainfall runoff forecasting 4. Maritim Territory, U.S.S.R.**—*I.L.D.*

12.8–206 551.509.58:551.579.4(472

†Grushevskiĭ, M. S. and Lazarenko, N. N., **Izuchenie Leningradskikh navodneniĭ i ik predskazanie.** [Study of Leningrad floods and their forecasting.] *Moscow. Gosudarstvenn Okeanograficheskiĭ Institut, Trudy*, No. 41:142–158, **1957.** fig., table, 31 refs. **DLC**—Th characteristics of floods and causes of their origin have been studied over a long period of tim The present problem is related to the development of rational methods for forecasting flooc on the basis of available material. The studies of this material and perfection of the forecastin methods are carried out by many Soviet scientific organizations (Leningrad Division of th State Oceanographic Institute (LO-GOINA); North-Western Administration of the Hydr meteorological Service (SZUGMS); Main Geophysical Observatory (GGO); Channel Lab oratory of the Main Experimental Base of The State Hydrological Institute (GEB-GGI) The historical background of the investigation is reviewed from the early period of St. Peter burg (1691) up to the latest flood (1955) with the tabulated data of 217 floods. Variou natural symptoms, leading to conclusive forecasts, are studied and reproduced in laborator experiments. Moving atmospheric front with cyclonic system of winds has important effe on floods as indicated by the illustration. *Subject Headings:* **1. Flood forecasting 2. Leningra Region, U.S.S.R.**—*N.P.S.*

F3. GLACIOLOGY

See also: **Glaciological Notes** (IGY), 12.8-35; **Recent evidence of a more ancient glaciation of the Russian plain** (U.S.S.R., Moskvitin), 12.8-377; **Late Pleistocene and recent limits of the Ross Ice Shelf, Antarctica** (Thomas), 12.8–378.

12.8–207 551.506.22 551.584.34 551.324.29(79

Sater, John E., **Glacier studies of the McCall Glacier, Alaska.** *Arctic*, Montreal, 12(2 82–86, June **1959.** 3 figs. Also: Mason, Robert W., **The McCall Glacier project and i logistics.** *Ibid.*, 12(2):77–81, June **1959.** 3 figs. Also: Keeler, Charles M., **Notes on th geology of the McCall Valley area.** *Ibid.*, 12(2):87–97, June **1959.** 6 figs., 5 refs. **DW DLC**—An all-out effort was made in August 1956 to find out in the highest area of the Brook Range, around 144°W and 69°30′N, a valley glacier that could be used for a micrometeorologic and glacier movement survey program during the IGY. The McCall Glacier Project w established by the U. S. IGY Glaciological Panel. A reconnaissance was undertaken initial in 1956 but by April 1957 a temporary camp was established, later it was completely outfitte The overall length of the McCall Glacier is about 8 km, an average width of 640 m and a area of 5.12 sq km. Its highest reaches are at an altitude of over 2700 m above sea lev These reports describe the particular drainage basin, the micrometeorological and climatologic factors that have been so far studied at this station. They include the geology of the valle data analysis and conclusions on the area that lies between the McCall Glacier and the Ja River. A correlation of the glacial sequence in the valley is made on the basis of the mo phology of the deposits and their geographical distribution. *Subject Headings:* **1. Glac micrometeorological data 2. Glacial climates 3. IGY glaciological program 4. McC Glacier, Alaska.**—*N.N.*

12.8–208 551.324.28:551.578.46(99)

*Zumberge, James H.; Giovinetto, Mario; Kehle, Ralph et al., **Deformation of the Ross Ice Shelf near the Bay of Whales, Antarctica (Final Report of the Ross Ice Shelf Deformation Project, U. S. National Committee, IGY).** *International Geophysical Year*, 1957/1958, *IGY World Data Center A (for) Glaciology, IGY Glaciological Report Series*, No. 3, May 1960. 148 p. 34 figs. (some fold.), numerous tables. Price: $3.00. DWB (551.311 1612gL)—The third and final report of the Ross Ice Shelf Deformation Project contains reports of mineralogical, stratigraphic and structural studies and measurements. In addition data calculated to show the snow accumulation, in places from 1914 to 1957, in some places 5 year mean accumulations, and in others 1957–58 accumulation. A map of the structural features is included. Photographs and photomicrographs of various ice features are included. *Subject Headings:* **1. Ice shelves 2. Snow accumulation 3. Ross Ice Shelf, Antarctica. I. Reid, John.**—*E.Z.S.*

12.8–209 551.324.6:551.578.46(472)

Svatkov, N. M., **Vozobnovlenie firnovogo pitaniia lednikovogo pokrova Novoi Zemli.** [Resumption of the nourishment of the glacial cover in Novaya Zemlya by firns.] *Akademiia Nauk SSSR, Doklady*, 131(1):141–142, 1960. 2 refs. DLC—During the Second Geophysical Year (1932–1933) it was established that no firn or firn ice occurred in the region of the ice ridge between Russkii Gavan' and the Zaliv Blagopoluchiia. Under the layer of this year's snow there was observed blue glacial ice with an internal gas pressure of 2.23 atm. normal for depths of the order of 15 m. Such a high gas pressure with large crystalline ice structure indicated intense oblation. Observations made during the IGY of 1957–1958 have revealed the following changes: (1) the period with positive air temperatures in the region of the ice ridge lasted 5–5.5 weeks and the balance of matter at a height of 776 m was positive and equalled 20 cm of firn; (2) in the fall of 1957 the snow line lay at 570 m—on the edge the Iablonskiĭ Barrier formed by terrace under the ice; the firn layer grew rapidly from the Iablonskiĭ Barrier to the ice ridge where it attained a thickness of 16 m; the sequence of firn layers and ice somewhat above the snow line indicated an annual increase of 10–20 cm of snow layer. In a 6 m trench 115 cm deep there were observed six such layers separated by continuous ice layers at depths of 12–14, 27.6–29, 39–41, 65–67, and 89–92 cm; the observed firn layer was not more than 2 m thick, so that it must have been forming over 10–12 years; below the edge of the Iablonskiĭ Barrier on the surface of the glacier a whitish ice with large bubbles free from solid particles was observed; this zone occupied no more than 2 km. Farther down it was replaced by streaky ice consisting of long parallel bands of blue and whitish blue ice of uniform width (10–20 cm) extended along the direction of motion of the glacier. Three to five km farther this ice was replaced by deep glacier ice. The speed of movement of the ice in the extruded tongue of this portion of the glacial cover (in the Shokal'skiĭ Glacier) was equal to about 150 m/year. *Subject Headings:* **1. Glacier nourishment 2. Firn 3. Novaya Zemlya, USSR.**—*I.L.D.*

12.8–210 551.324.6(485)

†Schytt, Valter (*Dept. of Geog., Univ. of Stockholm*), **The glaciers of the Kebnekajse-Massif.** *Geografiska Annaler*, Stockholm, 41(4):213–227, 1959. 7 figs., table, 16 refs. DLC—A general inventory of the distribution of glaciers in Sweden shows that there are 237 glaciers covering a total area of 310 km². The glaciers have been plotted directly from aerial photographs and the resulting sketch has been transferred to topographic sheets at a scale of 1:200,000. Regional and size distribution are indicated. Following a description of several groups of glaciers a few remarks are made about the deglaciation of the area. There is ample evidence that the ice retreated towards some of the high mountain massifs that acted as local culmination centers during the last stages of the deglaciation. Kebnekajse was one of these centers. *Subject Headings:* **1. Glaciers 2. Kebnekajse Massif, Sweden.**—*E.Z.S.*

12.8–211 551.332:551.326.62

Holdar, C. G. (*Dept. of Geog., Univ. of Stockholm*), **The inland ice in the Abisko area.** *Geografiska Annaler*, Stockholm, 41(4):231–235, 1959. 2 figs., 3 refs. DLC—The glacial history of the Abisko area is given on the basis of numerous morphological studies of the Area. A sketch shows the changes of the ice surface. The highest level of the inland ice in northern

Lapland was well above the highest summit shown in the sketch. The latest stage of th deglaciation in the Abisko region was controlled by the topography and by the predominatin west-wind drift of snow which was accumulated on the lee sides. A topographic map (scal 1:100,000) of the Abisko-Karsa area is included. *Subject Headings:* **1. Glacial histor 2. Abisko region, Sweden.**—*E.Z.S.*

12.8–212 551.332.2/5(485

†Hoppe, Gunnar (*Dept. of Geog., Univ. of Stockholm*), **Glacial morphology and inland ic recession in northern Sweden.** *Geografiska Annaler*, Stockholm, 41(4):193–212, **1959.** 1 figs., 40 refs. **DLC**—This paper gives a general view of the final stage of the Würm (Wisconsin glaciation in northern Sweden and demonstrates the principles of deglaciation, late changes i the directions of ice movement, and the morphological activity of the ice remnants and thei meltwater streams. The discussion concerns the province of Norrbotten in Sweden. Aeria photography has made possible a quite complete mapping of meltwater channels, eskers an other glacifluvial deposits, drumlins and other kinds of moraines. The most recent ice move ment directions in northern Sweden are shown. At the maximum extent of the last glaciatio the center of the ice sheet was situated far to the east, probably over the Gulf of Bothnia towards the final stage the center moved westwards to a position over the mountains. *Subje Headings:* **1. Ice recession 2. Glacial morphology 3. Norrbotten, Sweden.**—*E.Z.S.*

12.8–213 551.33

Maksimov, E. V., **Aganakattinskii uzel sovremennogo oledeneniia v Dzhungarsko Alatau.** [The Aganakatty center of contemporary glaciation in the Dzhungarian Ala Tau. *Vsesoiuznoe Geograficheskoe Obshchestvo Leningrad, Izvestiia*, 92(3):263–272, May/June **1960** 4 figs., 9 refs. **DWB, DLC**—The material on the glaciers of the three left tributaries of th first Tentek—the Aganakatty, Dzhilysai and Kairakty Rivers was obtained by an expeditio of the A. N. Gertsen Pedagogical Institute to the Dzhungarian Ala Tau in 1957. The hydrolog of the three rivers and the structural features of the area are described briefly. A detaile account is given of the extent, firn, snow and ice characteristics and moraine complexes o individual glaciers belonging to the basin of the Aganakatty River (Kavraiskiĭ Glacier, Krasov skiĭ Glacier, Lovago Glacier, Aisberg Glacier, Akshoshak Glacier) and of the basins of th Dzhilysai and Kairakty rivers including the Baranskiĭ Glacier and the Kairakty Glacier. Th general aspects of the glaciation are discussed and a map and photographs of individual glacier are included. *Subject Headings:* **1. Glaciers 2. Dzhungarian Ala Tau, Asiatic U.S.S.R** —*I.L.D.*

12.8–214 551.324.4(234.8

Kemmerikh, A. O., **Novyĭ raĭon oledeneniia (Ledniki Poliarnogo Urala).** [A new regio of glaciation (Glaciers of the polar Urals).] *Priroda*, Moscow, No. 2:78–79, Feb. **1960.** 2 fig **DLC**—The first glaciers in the Urals were discovered in the Sablinsk Range only 30 years ag In recent years more than 20 cirque and pendent glaciers with an area of about 5 km² hav been discovered in the Polar Urals. In addition to these glaciers, glaciers have been foun with an extension of more than 2 km. All the glaciers of the Polar Urals are concentrate at an altitude of 500–1000 m above sea level and are nourished chiefly by drift snow. Mo of them are located in deep cirques and troughs on the windward southeastern and easter slopes of ridges. They are found rather rarely on open slopes. The surfaces of all glacie show streakiness indicating a stratified ice structure. Owing to active movement glacie create lateral and terminal moraines and wide fissures. At present the glaciers are in retrea Their melting rate in July is greater than that of the Tien Shan and Pamir glaciers because their lower positions. The area of 5 glaciers of the Polar Urals exceeds the area of all glacie in the Cispolar Urals. Some of the largest glaciers are described in order of size; the Institu of Geography of the Academy of Sciences of the U.S.S.R. Glacier (1.4 km²), the Moscow Sta University Glacier (1.15 km²) and the Dolgushin Glacier on the southeast slope of the Och Nyrd Range (1.12 km²). The Oche-Nyrd Range, which is the most northern center of co temporary glaciation in the Urals, contains traces of ancient glaciation in the form of morain boulders, etc. *Subject Headings:* **1. Glaciers 2. Ural Mts., U.S.S.R.**—*I.L.D.*

12.8–215 91.04(236.7) 551.324.6(236.7)

Whittow, John B., **The glaciers of Mount Baker, Ruwenzori.** *Geographical Journal*, London, 125(3/4):370–379, Sept./Dec. 1959. 3 figs., 4 photos, 18 foot-refs. **DLC**—A report of the examination of the glaciers on the southern slope of Mount Baker, made during an expedition in June 1958. This was the second expedition of a program to accumulate data on ice masses undertaken by a small party of geographers and a geologist from Makerere College, the University College of East Africa. On the basis of this examination the distribution and configuration of the glaciers are discussed. A comparison of the 1958 sketch map is made with the map based on the DUKE of ABRUZZI's observations in 1906. Information obtained on the rates of glacier recession is also discussed. Numerous photographs and graphical illustrations nicely illustrate the paper. *Subject Headings:* **1. Glacier research 2. Glaciological expeditions 3. Mount Baker, Ruwenzori, East Africa.**—*I.S.*

12.8–216 551.506.22:551.3:24.4(99)

International Geophysical Year, 1957/1958. IGY World Data Center A (for) Glaciology, American Geographical Society, N. Y., **Preliminary reports of the Antarctic and Northern Hemisphere glaciology programs.** Its *IGY Glaciological Report Series*, No. 1, July 1958. 14 sections separately paged. figs., tables. Price $3.00. **DWB** (551.311 I612gL)—These articles contain preliminary data in tables and on structural cross sections on IGY snow and glaciological studies in Antarctica (Ross Ice Shelf, Victoria Plateau, Byrd Station, McMurdo Sound) and on Blue Glacier, Mt. Olympus and the Cascade Mountains of Washington State; on Juneau Ice Fields and the Arctic Pack Ice and on Fletcher's Ice Island (T-3). Articles were prepared by leading glaciologists such as N. UNTERSTEINER; F. L. BADGLEY, E. LA CHAPELLE and others. *Subject Headings:* **1. IGY glaciological program 2. Antarctica 3. Olympic Mts., Washington 4. Juneau Ice Field, Alaska 5. Arctic Ice Island (T-3).**—*M.R.*

F4. ICE

See: **Study of hardness of ice** (Krushchov, Berkovich), 12.8–22; **Hummodked ice distribution** (Gonin), 12.8–43.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION (551.501)

See also: **Principles of radar** (Sivers et al.), 12.8–11; **Items** 12.8–34 to 12.8–36; **U. S. research at drifting stations, Arctic** (Cottell), 12.8–39; **366 days on an ice island** (Sychev), 12.8–42; **Use of data in calculating glaze loads** (Rudneva), 12.8–105; **Measurement of wind velocity and power** (Golding), 12.8 107; **Audio systems for radio-range station weather receivers** (Ives), 12.8–115; **Electron densities in F region from rocket measurements** (Nisbet, Bowhill), 12.8–155; **Hydrological networks and methods,** 12.8–202; **Methods used in U. S. for calculating transformation of flood waves** (Nechaeva), 12.8–203; **IGY station, San Salvador** (Möller), 12.8–228; **Final Report 1956/1957 on Contract Cwb-9006** (Blue Hill Met. Obs.), 12.8–229; **Comparison of Yuma Test Station and Yuma W.B. met. records, 1952–1956** (Nelson), 12.8–231; **Scientific Report No. 2 prepared under contract with U. S. Weather Bureau, National Hurricane Research Project,** 12.8–294; **Reduction of results of actinometric observations to a single series** (Goïsa), 12.8–312; **Guide to soil temp. obs.** (Eckel), 12.8–321.

12.8–217 551.501

Hagarthy, J. H. (*Office of Clim., U. S. W. B.*), **Awards for Weather Bureau cooperative observers.** *Weatherwise*, Boston, 13(2):55–58, April 1960. 3 figs. **DWB**—Describes the work done by the cooperative observers of the Weather Bureau. More than 11,000 are engaged in this work. The observers are given awards for service of 10 yrs or more. Highest awards are the Thomas Jefferson and John Companius Holm awards, given to the most efficient workers. *Subject Headings:* **1. Cooperative observers 2. Awards 3. U. S. Weather Bureau awards.**—*A.H.K.*

12.8–218 551.501.45:519.241

Moran, P. A. P. (*Australian Natl. Univ., Canberra*), **Regression, correlation and structur** *Australian Meteorological Magazine*, Melbourne, No. 24:1–9, March **1959.** 4 refs., eqs. **DW** —The paper sets out the basic statistical theory of the association between two or more mea ured quantities. The distinction is made between a mathematical variable and a rando variable or variate, and the concept of the "power" of a significance test is explained. Th analysis of association is carried out by the use of four models, and the theory involved in ea case is explained. *Subject Heading:* **1. Meteorological statistics.**—*Author's abstract.*

12.8–219 551.501.721:551.521

*Goisa, N. I., **Metodika rascheta mesiachnykh summ rasseiannoĭ i summarnoĭ radiats po srochnym nabliudeniiam.** [Methods of computing monthly totals of diffuse and glob radiation from regular observations.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidr meteorologicheskiĭ Institut, Trudy*, No. 14:79–90, **1958.** 6 figs., 6 tables. **DWB** —The tr pezoidal method for determining monthly totals of radiation on the basis of fixed observatio is as follows: the mean monthly values of intensity of radiation for each fixed period as d termined from actinometric observations serve as the base of trapezoids; the heights of ea trapezoid constitutes the interval of time between fixed periods. The area of all trapezoi represents the total radiation for the 24 hr mean for a given month. The sum of total (ΣQ and the sum of diffuse (ΣD) radiation is given by a formula of the type:

$$\Sigma Q = \bar{Q}_{\tau_1} \cdot \frac{\bar{Q}_1}{2} + 180\left(\frac{\bar{Q}_1}{2} + \bar{Q}_2 + \bar{Q}_3 + \bar{Q}_4 + \frac{\bar{Q}_5}{2}\right) + \Delta\tau_2 \cdot \frac{\bar{Q}_5}{2}$$

where $\Delta\bar{\tau}$ and $\Delta\bar{\tau}_2$ respectively are $\overline{\Delta\tau}_1 = \bar{\tau}_1 - \bar{\tau}_{sunr}$ and $\overline{\Delta\tau}_2 = \bar{\tau}_{suns} - \bar{\tau}_5$, where $\bar{\tau}_{sunr}$ and $\bar{\tau}_{suns}$ = mea monthly time of sunrise and sunset, $\bar{\tau}_1$ and $\bar{\tau}_5$ = time of first and final observation, $\bar{Q}_1, \bar{Q}_2, \bar{Q}_3, \bar{Q}$ $\bar{Q}_5$ = mean monthly values of intensity of total radiation at fixed observations. The month totals are determined by multiplying the sums for the mean 24 hrs by the number of days in given month. The computation of monthly totals of scattered and total radiation by t trapezoid method with fixed observations leads to considerable random and systematic erro The systematic errors result from deviation from the daily course of radiation. These can eliminated by introducing correction coefficients which have an annual variation dependi upon geographic latitude. The random errors are primarily the result of the "instantaneity of the fixed observation. The reliability of monthly totals of incoming radiation obtain through fixed observations can be increased by carrying out, at stations without automa recorders, supplementary observations (with actinometer and shaded albedometer) at 11 and 1400 o'clock. *Subject Headings:* **1. Global radiation measurement techniques 2. Diffu radiation measurement techniques 3. Radiation computation.**—*I.L.D.*

12.8–220 551.501.75:551.554(2

Portman, Donald J. (*Assoc. Res. Meteorologist, Mich. Univ.*), **Improved technique f measuring wind and temperature profiles over water and some results obtained for light win** *Conference on Great Lakes Research, 3rd, Ann Arbor, Mich., May* 6–7, 1959, *Proceedings*, pu **1960.** p. 77–84. 5 figs., table, 8 refs. **DWB** (M82/779 C748pr)—An improved experiment arrangement for accurate measurement of wind profiles over deep water was devised a tested. The techniques and the instruments used appeared to obviate some of the importa difficulties commonly encountered. The drag coefficients computed from equilibrium profi in nearly adiabatic conditions support the idea that the drag coefficient increases with increasi wind speed. Profiles measured in transient conditions are likely to deviate significantly fr the logarithmic relationship and, therefore, cannot be used to compute sheer stresses and dr coefficients. *Subject Headings:* **1. Wind measurement techniques 2. Temperature profi 3. Great Lakes.**—*E.Z.S.*

12.8–221 551.501.75:551.508.5

Vorob'ev, I. E., **Sravnimost' rasschitannykh velichin skorosti vetra po dannym anem metra s nabliudennymi po fliugeru.** [Comparability of computed wind speed values fr anemometer data with weather vane observations.] *Meteorologiia i Gidrologiia*, Leningr No. 8:37–38, Aug. **1959. DWB, DLC**—The author compared wind speeds data measured

anemometers and by wind vanes at the stations Voeĭkovo and Erbent which differ in respect to climatic and physical geographic conditions. The data include simultaneous observations on wind velocity made at heights of 1, 3 and 11 mm at Voeĭkovo and at 3 and 11 mm at Erbent. In the former the measurements were made with hand anemometer at the two lower levels and with a wind vane at the uppermost; in the latter a hand anemometer was used for the lower level and a wind vane for the upper. The rates of wind velocities at two levels measured with an anemometer were constant for all velocities (up to 17 m/sec at the height of the wind vane). The rates of wind velocities at two levels measured with different apparatus were not constant and depended on wind speed. In order to determine the error of computed data, if it is necessary to obtain values at wind vane height from anemometer data at 1–3 m level, the wind velocity at 11 m was computed by means of $u = u_1 \frac{1gz - 1gz_o}{1gz_1 - 1gz_a}$ where z_o for Voeĭkovo was 0.014 m and 0.005 m for Erbent. The computed wind velocities at 11 m for Voeĭkovo and Erbent are compared and analyzed. *Subject Headings:* **1. Wind speed computations 2. Anemometry 3. Wind vane observations.**—*I.L.D.*

12.8–222 557.501.75:551.551:551.554

Wiin-Nielsen, A. (*Joint Numerical Weather Prediction Unit, Suitland, Md.*), **On a graphical method for an approximate determination of the vertical velocity in the mid-troposphere.** *Tellus*, Stockholm, 11(4):432–440, Nov. **1959.** 2 figs., 2 tables, 6 refs., 4 eqs. **DLC**—A simple graphical method for determining the vertical velocity from a simplified, but consistent form of a diagnostic equation for this quantity is developed. It is shown that the main term in the equation is the advection of temperature in the vorticity field. Section 2 contains simple rules from which the sign of the vertical velocity may be determined. An approximate solution to the equation is found in section 3, while section 4 contains an investigation of the accuracy of this solution as function of the scale of the motion. Different types of approximate solutions are investigated. Section 5 contains an example of the use of the method. *Subject Headings:* **1. Vertical velocity determination 2. Graphical methods.**—*Author's abstract.*

12.8–223 557.501.776:551.576.1:551.575.1

*†D'iachenko, P. V., **Opyt primeneniia metodov matematicheskoĭ statistiki k izucheniiu mikrostruktury tumanov i oblakov.** [Attempt at using the method of mathematical statistics for the study of the microstructure of fogs and clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 101:3–50, **1959.** 11 figs., 8 tables, 5 charts, 34 refs., 74 eqs. **DWB**—The author examines the experimental problem of the selective determination of the dimensions of natural cloud and fog particles from a probability statistical point of view. The results of this comprehensive study are as follows: the construction of experimental curves for determining the distribution of fog and cloud particles is developed by HOUGHTON and known as the "distribution of volumes," contradicts the method used in the U.S.S.R. and is shown to be statistically inconsistent. The evaluation of the height of experimental distribution proposed by HOUGHTON is erroneous. A new characteristic, namely, the height of the experimental curve, which was used to solve a series of specific problems is introduced for comparison with experimental data. It is shown that for the most probable height of the experimental curve a value close to unity can be used. A new class of single peak curves whose shape appears to be a function of two parameters is introduced. On curves of this class whose height is close to unity a relationship between height and width is demonstrated. An analysis of the effect of the finiteness of the width interval shows that both the width of the intervals and their number can be selected experimentally for experimental distributions of natural fog and cloud droplets. Investigation of the finiteness of the selection volume shows that the frequency n_1, if the intervals are sufficiently small can be considered approximately as independent, but a polydisperse fog or cloud can be assumed as consisting of a number of finite monodisperse components. The experimental distribution shows that the lack of a proper statistical approach to the determination of the dimensions of natural cloud and fog particles leads to statistical values of poor quality. There is established a criterion of adequacy permitting a rational selection of volume for a newly constructed experimental curve as a function of statistical error in the interval of the maximum occupance, width of the interval, reliability of measurement, and most probable dimensions and height of the curve. A method for analyzing multiple

peak experimental distributions for establishing their character appears as a further develop ment of the ideas of A. K. Mitropol'skii. The process of complete formation of an exper mental curve is considered as consisting of three stages differing in their statistical relatio indices. The multi-peakedness of most experimental distributions for natural fog and clou particles does not appear authentic. The mean dimensions first used to determine a curv express best the experimental distribution of fog particles (method of movements). Th method of relationship of mean dimensions is used to establish the structural difference between distributions for radiation and advection fogs. Comparison with clouds develope vertically shows that radiation fogs are structurally similar to the lower boundary of clou and advection fogs are analogous to the middle and upper boundary of clouds. Experiment data are presented in appendices. *Subject Headings:* **1. Microstructure of fog and clou 2. Statistical methods 3. Advection fogs.**—*I.L.D.*

12.8–224 551.501.777:551.508.7

Kaulin, V. N., **O metodakh ucheta zimnikh osadkov v Kamennoĭ Stepi.** [Methods calculating winter precipitation in the Kamennaia Steppe.] *Meteorologiia i Gidrologii* Moscow, No. 10:36–38, Oct. **1959.** table, 3 refs. **DWB, DLC**—Two methods are describe and their accuracy analyzed during winters of 1950–1958 in nine water basins, located in ope field and forest regions. The measurements were made with precipitation meters and b rain meters, installed under different wind conditions. Advantages and disadvantages of eac method were discussed separately and illustrated with the tabulated observed data. Th results of both methods are compared with effects of wet snowfalls, thawing, windstorms an other factors. In normal winter conditions the difference in results obtained by both metho averages ±9%. *Subject Headings:* **1. Winter precipitation measurement techniques 2. K mennaia Steppe, Voronezh Region, U.S.S.R.**—*N.P.S.*

12.8–225 551.501.777 551.582.3:551.577

Levin, A. G. and Miachikov, V. D., **K metodike ucheta i kartografirovaniia osadko** [Method of calculating and mapping precipitation.] *Leningrad. Glavnaia Geofizicheska Observatoriia, Trudy*, No. 64(126):17–23, **1956.** 5 figs., 13 refs., 2 eqs. **DWB**—Owing to th failure of precipitation to fall into rain gages with cone shaped guards because of wind spee the authors carried out a study to determine the amount of precipitation that is blown awa At 41 weather stations located in northeastern Asia the usual rain gages were supplement with the Tret'iakov precipitation gage and special snow surveys were made. Special observ tions have been carried out since 1948 in a closed valley (5.35 km²) where 8 paired ra and precipitation gages, each pair provided with a wind vane were installed. Frequent sno surveys were made along 16 profiles and snow densities were measured at 200 points. Duri the summer months the Tret'iakov precipitation gage and the rain gage with cone shap shield catch the same amount of rainfall. Data are presented showing that in comparis with snow surveys the data of the Tret'iakov precipitation gage are more accurate than tho of the rain gage. To the latter a correction of 10–15% must be made. The correction expressed by the equation $\Sigma x_p/\Sigma x_r = k = f(V_m)$ where Σx_p = monthly precipitation total measur by the precipitation gage. Σx_r = monthly precipitation total measured by the rain ga V_m = mean wind velocity m/sec and k = coefficient expressing failure of rain gage to cat precipitation. Curves of $k = f(V_m)$ are presented. There exists a vertical zonation of preci tation, the totals of which increase up to elevations $t = 1000$ m and begin to diminish at 100 1200 m. In determining precipitation totals in mountain regions by using the water balan in hydrological calculations the vertical zonality can be established by the method of verti gradients. The vertical distribution of precipitation totals can be computed by the follow method. The mean weighted amount of precipitation in a mountain river basin is expressed

$$X_m = \frac{F_1X_1 + F_2X_2 + \cdots F_nX_n}{100}$$ when $F_1F_2 \cdots F_n$ = areas at 100 m intervals of elevation

percent of the total area determined by the hypsometric graph of the basin: $X_1, X_2, \cdots X_n$ precipitation totals at their heights computed from $X_i = X_{meas} \pm \sum_{H_{meas}}^{H_i} DX$, where X_1 = to precipitation at height H_i, X_{meas} = measured precipitation total at height of weather stati $H_{meas} \sum_{H_{meas}}^{H_i} \Delta X$ = algebraic total of vertical precipitation gradients determined by means of

integral curve of variations of precipitation with height. *Subject Headings:* **1. Precipitation measurement techniques 2. Snow density measurement techniques 3. Vertical precipitation gradient 4. Tret'iakov precipitation gage 5. Asiatic U.S.S.R.**—*I.L.D.*

12.8–226 551.501.777:551.508.77:551.577.32(478)

Razumikhin, V. N., **Ob uchete dozhdemerom zimnikh osadkov v iuzhnom Zavolzh'e.** [The calculation of winter precipitation in southern Transvolga with a rain gage.] *Meteorologiia i Gidrologiia*, No. 1:46, Jan. **1957.** table. **DWB, DLC**—Over a 4 year period extensive measurements were carried out by means of snow surveys in southern Transvolga on the snow reserves at the beginning of thaw and on the total of winter precipitation as measured by a rain gage. Numerical data indicate that the difference between snow reserves at the beginning of thaw and total winter precipitation exceeds snow reserves at start of thaw. This is explained by the frequency of snowstorms during which considerable amounts of snow are blown into the rain gage. This may compensate for the snow blown out from the rain gage. *Subject Headings:* **1. Winter precipitation calculation 2. Snow surveys 3. Transvolga, U.S.S.R.**—*I.L.D.*

12.8–227 551.501.9:620.92:539.1(796)

Yanskey, George R. (*U. S. W. B., Idaho Falls, Idaho*), **Weather Bureau operations and research at the National Reactor Testing Station.** *Weatherwise*, Boston, 13(5):187–191; 203, Oct. **1960.** 4 figs., 10 refs. **DWB**—The research done by U. S. Weather Bureau in regard to safe operation of the nuclear reactors is described. One location of such research is the National Reactor Testing Station at Idaho Falls. The meteorological research at the station is directed at improving diffusion forecasts. The area where the station is situated is mostly flat with dry air and low cloudiness. The two main weather stations are separated by great distances. During winter these stations sometimes show a difference of 25°F. Investigations have been carried on to obtain a better knowledge of meteorological parameters. Research is also being done to design the equipment to digitalize the information from meteorological research tower. *Subject Headings:* **1. National Reactor Testing Station 2. Diffusion forecasts 3. Idaho Falls, Idaho.**—*A.H.K.*

OBSERVATIONAL DATA (551.506)

See also: **Radiological Physics Div. semiannual report, Jan.–June 1959** (U. S. Argonne Natl. Lab.), 12.8–18; **Met. Obs., Ice Island T-3** (Banks, Partanen), 12.8–38; **U. S. research at drifting stations, Arctic** (Cottell), 12.8–39; **Atmos. net radiation flux, Thule** (Fenn, Weickmann), 12.5–40; **90° South: story of American S. Pole conquest** (Siple), 12.8–44; **Atmos. fronts, Antarctica** (Astapenko), 12.8–50; **Met. of interior of E. Antarctica** (Gusev, Rusin), 12.8–51; **Weather along the route of the "Ob"** (Khromov), 12.8–52; **Utilization of satellite observations in theory and practice of numerical weather prediction** (Holl), 12.8–259; **Wind variability** (Ellsaesser), 12.8–275; **Tropopause at Tananarive,** 12.8–281; **Hurricane season 1958** (Davis), 12.8–292; **Annual report of hurricane season 1958, Miami,** 12.8–296; **Radiation measurements in Potsdam and Persnäs** (Hinzpeter, Wörner), 12.8–301; **Global solar radiation and daylight, Jerusalem, Oct. 1956** (Ashbel), 12.8–303; **Balloon observations of earth radiation in infrared** (Strong), 12.8–314; **Monthly normal. temps.** (U. S. W. B.), 12.8–319; **Checking and analysis of soil temp.** (Eckel), 12.8–322; **Annual course of soil temp., Belgrdae** (Dobrilović), 12.8–325; **Upper wind obs., tropical Indian Ocean** (Hogarth et al.), 12.8–348; **Tabulated upper wind data, Australia** (Lamond), 12.8–349; **Mean monthly values of precipitable water, U. S.** (Reitan), 12.8–355; **Tropical met.: obs. studies of tropical clouds** (Wexler, Malkus), 12.8–359; **Harmonic analysis of precip. series** (Mosetti), 12.8–365; **Long term climatic means, Israel,** 12.8–366; **Studies of rainfall, Rajasthan** (Rao), 12.8–367; **105-years of met. obs., Linz** (Roller), 12.8–372; **Does climate become warmer?** (Wagret), 12.8–376; **Atmospheric electricity observations in India during IGY** (Venkiteshwaran), 12.8–403; **Conclusions from atmospheric electricity observations made in Kiev in 1949–1953, Ukraine S.S.R.** (Muchnik), 12.8–404.

12.8–228 91.04(728.4) 551.506.22:551.501.9 551.511.33

Möller, F. (*Mainz*), **Die IGJ-Station San Salvador.** [The IGY station at San Salvador.] *Meteorologische Rundschau*, Berlin, 12(4):130–131, July/Aug. **1959.** fig. **DWB, DLC**—The

German branch of the IGY sent a meteorological expedition to El Salvador. It was under the leadership of F. Möller and its scientific members were G. Rönicke, E. Rod, A. Kunkes and D. Lorenz. Its program included the following: (1) continuous and complete measurement of all components of the heat balance of the earth by recording global radiation of sun and sky reflected short wave radiation upward and downward and total radiation balance sunshine duration, heat penetration into the earth from 0 to 50 cm depth determination of the transition of sensible and latent heat from the surface of the soil to the atmosphere; (2) recording of all atmospheric electricity magnitudes at the earth's surface and (3) investigation of long wave radiation balance of the fall atmosphere. The methods and instrumentation for making the various measurements are mentioned and the administration of the research program are described. *Subject Headings:* **1. Meteorological expeditions 2. IGY radiation program 3. Atmospheric thermodynamics 4. San Salvador, El Salvador.**—*I.L.D.*

12.8–229 551.506.3 551.501.81:551.577 551.509.324.2

Blue Hill Meteorological Observatory, **Final Report 1956/1957 on Contract Cwb-9006** Feb. 27, **1958.** 19 p. fig., table. typescript. Contents: Conover, John H. and Ashley Richard E.: **Collection and processing of World Weather Records,** p. 2. Boucher, Roland J. **Value of radar in forecasting cold season precipitation, especially at Boston,** p. 3–8. Boucher Roland J.: **Geographical distribution of initial convective radar echoes in the absence o general precipitation,** p. 9–10. Conover, John H.: **Problems of forecasting snowfall and snow vs. rain at Boston,** p. 11–14. **Current weather reports to East Boston, July 1, 1956–,** p. 15 **The climatic record,** p. 16. **Solar Radiation Cooperative Program,** p. 17. **Future work,** p. 18 **DWB** (M(055) B658c)—World Weather Records have been computed and sent to the Weathe Bureau for publication. Summaries of various phases of the work being conducted at Blue Hill at the time of the death of Charles F. Brooks in Jan. 8, 1958, and especially the use o radar in forecasting cold season precipitation at Boston, are presented and the snow vs. rain forecasting problem which has been studied for 8 years at Blue Hill with results indicating qualitative but quantitative success, are outlined. *Subject Headings:* **1. World Weathe Records 2. Radar precipitation forecasting 3. Snowfall forecasting 4. Boston, Mass 5. Blue Hill, Mass.**—M.R.

12.8–230 551.506.3:551.577.32:519.241.6

*MacDonald, James E. and Green, Christine R. (*both, Univ. Arizona*), **Effects of inhomo geneity and record length on estimates of correlation and variability of precipitation data** *Journal of Geophysical Research,* Wash., D. C., 65(8):2375–2381, Aug. **1960.** 4 figs., 2 tables 5 refs. **DLC**—Empirical estimates of the extent to which internal inhomogeneity and variabl length of record can influence the coefficient of correlation r and the coefficient of variation are summarized. The basic data used comprise 50-yr records of winter and summer half-yea precipitation totals for 50 stations well distributed throughout the United States. On th basis of an examination of double-mass plots for 37 stations, it is concluded that a 20% increas imposed on the latter half of each test station's record would constitute a comparatively larg degree of synthetic inhomogeneity for test purposes. The resulting effects on r and C ar regarded as not being serious for most purposes. About 85% of all r values computed fro such synthetically inhomogeneous records do not depart by more than one standard error fro the corresponding unadjusted r values, and 72% of the synthetic C values lie within one stand ard error of the corresponding unadjusted C values. By computing and C for record length varying from 10 to 50 yrs, the way in which r and C converge to their 50-yr values are examine It is concluded that at least 30-year samples are desirable in correlation and variability studie a result in agreement with previous estimates of record lengths required to obtain stabl estimates of mean precipitation amounts. Record lengths of 40 yrs are found to be essentiall as good as 50-yr series in specifying r or C. *Subject Headings:* **1. Precipitation data 2. Rainfa variations 3. Rainfall statistics.**—*Authors' abstract.*

12.8–231 551.506.3:551.501.9 (79

*Nelson, Ronald A., **Comparison of Yuma Test Station and Yuma Weather Bureau meteoro logical records, 1952–1956.** *U. S. Quartermaster Research and Engineering Center, Environmental Protection Research Div., Research Study Report,* RER-16, Nov. **1957.** 23 p. 4 figs

11 tables, 8 refs. **DWB** (M86 U585re)—This study, a comparison of meteorological records from Yuma Test Station and Yuma City Weather Bureau 17 miles apart, has been prepared to show graphically the differences and/or similarities that exist between the two meteorological stations. Tables and graphs were prepared for the various climatic elements considered in the report and a brief analysis of each may be found in the text. In general, there are few significant differences between the two stations for any of the climatic elements considered. Yuma Weather Bureau reports consistently more extreme maximum and minimum temperatures but the difference is usually not more than 1 or 2 Fahrenheit degrees. Precipitation, though irregular, averaged slightly higher at Yuma Test Station. The differences which do occur between the two stations are not great enough to cause concern on the part of testing agencies who utilize Yuma Test Station but depend upon Yuma Weather Bureau records for long-period normal values for the various climatological factors. *Subject Headings:* **1. Meteorological data comparison 2. Yuma Test Station, Yuma, Ariz. 3. Yuma, Ariz.**—*Author's abstract.*

12.8–232 551.506.3:551.582.2(234.42)

*Petrovič, Štefan (*Hydrometeorologisches Inst., Bratislava*), **Auswertung der fünfzehnjährigen Beobachtungen auf der Lomnitzer Spitze.** [Evaluation of 15 years of observations at Lomnitz Peak.] *Studia Geophysica et Geodaetica*, Prague, 3(1):62–81, **1959.** 9 figs., 5 tables, 9 refs. Russian summary p. 81. **DWB**—The observatory is located at the Lomnitz Peak, 2635 m.a.s. at 49°12′N, 20°13′E on the eastern ridge of the High Tatra mountain range. The observational period comprises 1940–1945 and resumed after military operations to include 1947–1957. The detailed tabulated data include: precipitation, cloudiness and sunshine, pressure, humidity and winds and increases the climatic knowledge of the northern Carpaths. Comparison of the annual variation in percentage of the total parable is held against the 1901–1950 data from Hurbanavo of air temperature, pressure, relative humidity, cloudiness and insolation. A research station mainly for cosmic radiation measurements is now under construction at Lomnitz Peak. *Subject Headings:* **1. Weather data 2. Lomnitz Peak, Czech.** —*W.N.*

12.8–233 551.506.3:551.582.2:519.2

Rijkoort, P. J., **Homogeniteit, betrouwbaarheid en reductie van klimatologische reeksen.** [Homogeneity, reliability and reduction of climatological series.] *Netherlands. Meteorologisch Instituut, Wetenschappelijk Rapport*, W. R. 58–3(III–222), **1958.** 30 p. 5 figs., 11 refs., 33 eqs. Mimeo. English summary. **DWB**—In the first part of this report we have traced how homogeneity is defined in climatological literature. In the second part the reduction of climatological series is treated. A formula contains the general method to reduce the mean value of a quantity over a period N with the aid of the mean value from another station to the mean value over a period N. The usefulness of the reduction is investigated. The conditions under which it is useful to reduce the mean value of a series are determined. The accuracy of the reduction is computed. The special reduction-methods, methods of differences and ratios, enclosed in the general reduction-formula, are considered. Some other possibilities are treated, in which symmetrical regression and "normal" regression are of importance. The results are elucidated by examples. Finally, the reduction of separate observations is considered. *Subject Headings:* **1. Climatological series 2. Homogeneity.**—*From author's abstract.*

12.8–234 551.506.5(82) 91.04(82)

Morandini, Giuseppe, **La Spedizione de Agostini alla Terra del Fuoco 1955–1956.** [The De Agostini Expedition to Tierra del Fuego, 1955/1956.] *Societa Geografica Italiana, Bollettino*, Ser. 8, 10(6/8): 257–272, June/Aug. **1957.** fig., 15 photos. English summary p. 272. **DWB**—The object of the Italian expedition to Tierra del Fuego was scientific, geographic and photographic, including the study of climatic and microclimatic phenomena with stations located in different topographic situations. Equipment used at the base station during the two months (Jan.–March 1956) at Campo di Caleta Escandallo (Cape Martinez), beautiful photographs of glaciers, snowy peaks and glacial lakes are included. Only two stations in the area have long meteorological records: 1) Punta Arenas (50 years) 2) Ushuaia (30 years). Only 5 of the 57 days at the base camp were without rain. Scientific data will be published later. *Subject*

Headings: **1. Tierra del Fuego Expedition, 1956 2. De Agostini Expedition 1955/56 3. Tierra del Fuego, Argentina.**—*M.R.*

12.8–235 551.506.7:551.510.53(4

Beelitz, P.; Clauss, J. and Fett, W., **Collection of statistical data for meteorological studies of the upper atmosphere.** Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Contract AF 61(052)-156, Technical (Scientific) Note, No. 1, July 31, **1959.** 20 p. 13 forms (some fold.), 19 refs. **DWB** m(051)B515te)—The task of the present research is to collect, check and supplement the nocturnal radiosonde ascents of the winter months Jan. Feb. and March 1955 through 1958 from 56 selected aerological stations in Europe and adjacent areas. As the result, data of pressure height, temperature and wind for the standard pressure levels 700, 500, 300, 200, 100 mb. as well as the surface data and sea-level pressure are to be given in a complete form on punched cards, lists and microfilms. This report describes the methods and means employed. Besides comments on the sources of data and the description of working operations, the synoptic-aerological criticism of the data and the developed scientific technical resources are given in more detail. The experiences with the individual radiosonde networks are pointed out. Finally a selection of scientifically and methodically interesting printing samples illustrates the methods used in this work. *Subject Headings:* **1. Upper atmosphere 2. Meteorological data 3. Europe.**—*Authors' abstract.*

12.8–236 551.506.7:551.587 551.509.317:551.547.5

§*Hennig, Horst, **40 jährige Monatsmittel der absoluten Topographien der 850 mb, 700 mb und 300 mb Flächen über der Nordhemisphäre für den Zeitraum 1900–1939.** [Forty-year monthly means of absolute topography of 850 mb, 700 mb and 300 mb surfaces over the Northern Hemisphere from 1900–1939.] *Berlin. Freie Universitat. Institut fur Meteorologie und Geophysik, Meteorologische Abhandlungen*, 4(3), **1958.** 55 p. 39 charts, 9 refs. **DWB** Review by J. K. BANNON in *Royal Meteorological Society, Quarterly Journal*, 85(363):78, Jan. **1959.**—The discussion is divided into the following main subjects: 1) Construction of the mean charts for long periods and 2) basic features of the general circulation in the new mean charts and the seasonal displacement of the individual activity centers. The series of charts includes 13 charts each for the 850, 700 and 300 mb levels. *Subject Headings:* **1. Mean monthly pressure charts 2. Upper air climatology 3. Northern Hemisphere charts 4. Northern Hemisphere**—*W.N.*

12.8–237 551.506.7:551.55

*Crutcher, Harold L., **Upper wind distribution statistical parameter estimates.** *U. S. Weather Bureau, Technical Paper*, No. 34, Nov. **1958.** 59 p. almost entirely tables, 18 refs. **DWB**—The urgency created by atomic and nuclear weapons, rocket and satellite vehicles and the economics of air transportation have greatly increased the use and importance of upper air wind data. Several meteorological services now publish valuable data on the United States, North Atlantic, North Pacific, Canadian, Arctic, Caribbean, Eurasian and adjoining areas. This technical report contains the parameters from various meteorological stations from the above mentioned areas. *Subject Headings:* **1. Upper air wind data 2. Northern Hemisphere**—*N.N.*

12.8–238 551.506.8:551.584.31:551.586(234.3

†Frenzel, Burkhard and Fischer, Hermann, **Beobachtungen zur Phänologie eines Alpentales** [Observations of phenology of an Alpine valley.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(2):231–256, **1957.** 6 figs., 4 tables, 59 refs. German, English and French summaries p. 231–232. **DWB**—Phenological observations in Stillach (Allgäu Alps) in 1951 and 1955 are described and compared with microclimatology. Observations of temperature, relative humidity, wind, cloud and evaporation were made at 8 stations, 910 to 1820 m a.s.l., and showed four height zones: above 1400 m, zone of general circulation; 1200–1400 m transition zone with phenological delay due to altitude; about 1100 m, relatively warm slope favoring plant development; 900–1000 m, up and down winds retarding development, large daily range of temperature. *Subject Headings:* **1. Phenology 2. Slope microclimatology 3. Bavarian Alps.**—*C.E.P.B.*

12.8–239 551.506.8(410)

*Jeffree, E. P. (*North of Scotland College of Agricul., Aberdeen*), **Some long-term means from The Phenological Reports (1891–1948) of the Royal Meteorological Society.** *Royal Meteorological Society, Quarterly Journal*, 86(367):95–103, Jan. **1960.** 8 tables, 10 refs. **DWB, DLC**—The Phenological Reports 1891–1948 of the Royal Meteorological Society are discussed; interpolated values in floral records have been recalculated, and 58-yr district and British Isles weighted means, and annual differences from these, have been calculated for 11 flowering events. 20-yr means and differences have been similarly calculated for a further 14 events, and the former approximately corrected to the 58-yr means. For 11 main flowers in the Phenological Reports, the mean difference in flowering dates between south and north Britain was 21 days later for a distance of some 400 mi farther north. Extremes of earliness and lateness have been tabulated for the British Isles weighted means for these 11 flowers over the years 1891–1948. Extreme earliness averaged 17.7 days and extreme lateness 17.1 days, but while extremes of earliness were fairly constant throughout the yr or possibly became a little greater for summer than for spring flowers, extremes of lateness were much greater for spring than for late summer flowers. These differences are directionally in deeping with the finding of HAWKE (1941) that in the winter months abnormally low temperatures are much more extreme than abnormally high values, while in summer the abnormally high values are more extreme than the exceptionally low. The standard deviations for the annual values of the British Isles weighted means are also given, and averaged 7.0 days for the 11 main flowers. *Subject Headings:* **1. Phenological data 2. British Isles.**—*Author's abstract.*

12.8–240 551.506.9(99)

Schumacher, N. J. (*Det Norske Met. Inst., Norway*), **Some problems of meteorological observing in polar regions.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 212–214. 2 refs. Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, **1957.** p. 212–214. **DWB, DLC**—Enhanced radiation from the snow surfaces in polar regions hampers reliable meteorological observations. Experiences at Maudheim showed that radiation error in screen was 3–4°C. and the mean difference at 12 GMT readings in the latter part of Dec. was 1°C. between the screened and the ventilated thermometers. Maximum value of 3 hr readings was +3.3°C. in the screen when the correct readings on the ventilated thermometer was −0.3°C. Aerological observations affected by the extreme cold include the radiosonde batteries and the bursting of the balloons at too low altitudes. The mean height of bursting dropped from 21.9 km. in the warmest month to 14.5 km. in the coldest. Some practical counter measures for several recording instruments are mentioned. *Subject Headings:* **1. Meteorological observation methods 2. Polar regions 3. Maudheim, Antarctica.**—*W.N.*

INSTRUMENT CARRIERS (551.507)

See also: **Space flight** (Ehricke), 12.8–12; **Barometric leveling** (Petrov), 12.8–25; **Items,** 12.8–74 to 12.8–82; **Rocket and satellite investigation of meteors** (Nazarova), 12.8–129; **Electron densities in F region from rocket measurements** (Nisbet. Bowhill), 12.8–155; **Faraday rotation measurements, Fort Churchill** (Prenatt), 12.8–156; **Climatological analysis of transosonde flights** (Angell), 12.8–241; **Utilization of satellite observations in theory and practice of numerical weather prediction** (Holl), 12.8–259; **Vertical distribution of clouds in frontal zones over West Siberia** (Sovetova), 12.8–299; **Balloon observations of earth radiations in infrared** (Strong), 12.8–314.

12.8–241 551.506.7:551.557:551.507.321

*Angell, J. K. (*U. S. W. B., Wash., D. C.*), **A climatological analysis of two years of routine transosonde flights from Japan.** *Monthly Weather Review*, Wash., D. C., 87(12):427–439, Dec. **1959.** 15 figs., 3 tables, 11 refs., 4 eqs. **DWB, DLC**—A climatological analysis is made of Navy-sponsored 300 mb and 250 mb constant-level balloon (transosonde) flights launched from Iwakuni, Japan, between Sept. 1957 and April 1959. Since the transosonde naturally provides information in a Lagrangian frame of reference, treated are the trajectories and trajectory dispersion, the magnitudes and periodicities of the velocity and ageostrophic velocity

components derived from the trajectories, and the separation between pairs of transosondes as a function of time after their release. In addition to the research benefits, the usefulness of transosondes in providing routine upper-wind data over the oceans is pointed out. *Subject Headings:* **1. Constant level balloon data 2. Upper air wind measurement techniques.**—*Author's abstract.*

12.8–242 551.506.7:551.557:551.507.321

Angell, J. K., (*U. S. W. B.*), **An analysis of operational 300-mb transosonde flights from Japan in 1957–58.** *Journal of Meteorology*, Boston, 17(1):20–35, Feb. 1960. 8 figs., 9 tables, 16 refs., 12 eqs. (For abstract on this title from a different source, *see* 10.10–151, Oct. 1959, *Met. Abs.*) **DWB, DLC**—This paper summarizes the operational 300 mb constant level balloon or transosonde flights made by the U. S. Navy from Iwakuni, Japan during 1957–58. On the average, the transosondes reached the west coast of the U. S. 3 days after release in winter and 4 days after release in spring and fall. The trajectories traversed the United States farther to the north in winter than in spring or fall. For these flights, the zonal standard deviation of position increased approximately linearly with time since transosonde release, whereas the meridional standard deviation of position remained practically constant after the transosondes had been aloft 3 days. The mean transosonde-derived wind speed at 300 mb was 71 kn while the mean cross-contour flow was 7.5 and the mean deviation between wind and geostrophic wind speed was 12.4 kn. Zonal and meridional ageostrophic winds derived from the transosondes suggest that at 300 mb, six or seven % of the north-ward transport of momentum at 37N is brought about by ageostrophic flow. Power spectrum analysis shows that the meridional wind tends to oscillate with a 54-hr period, corresponding to the average time it takes the transosondes at 300 mb to pass through a typical long wave in the westerlies. The wind speed and zonal wind component tend to oscillate with a period exceeding 5 days, a result of strong winds being found over Japan and off the east coast of the United States. Not as clear-cut is the tendency for the cross-contour flow to oscillate with a period of 30 to 36 hrs. Cross-spectrum analysis shows that for oscillations of period exceeding 2 days the maximum zonal wind is to be found near the pretrough inflection point along the wave-shaped trajectories while the maximum flow toward low pressure occurs near the trough line. However, for oscillations of period 36 to 16 hrs the maximum zonal wind is found in the northerlies and the maximum flow toward low pressure occurs on the ridge. Temperatures interpolated to the 300-mb transosonde positions suggest the presence of ascending air motion across the Pacific Ocean and descending air motion across the United States. Contour heights interpolated to the 300-mb transosonde positions suggest the presence at 300 mb between Japan and the east coast of North America of a northward ageostrophic flow of magnitude 2 kn. "Abnormal" flow is discussed briefly, and an example thereof is given. *Subject Headings:* **1. 300 mb transosonde flight 2. Ageostrophic flow 3. Japan 4. Pacific Ocean 5. U. S.**—*Author's abstract.*

12.8–243 551.507.352

Douthit, Thomas D. N. (*Air Force Camb. Res. Center*), **The C-130 as a support aircraft.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes*, No. 29, Dec. 1959. p. 156–158. 2 figs. **DWB**—The "Ski-130 Hercules" is the best aircraft for use in the Arctic. The C-130 is powered by four Allison T56 turbines, capable of delivering 15,000 horsepower and giving an average true airspeed of 300 knots up to 35,000 ft. It is able to fly 2000 mi with pay loads up to 15,000 lbs. Plans are being made for instrumenting the aircraft. *Subject Headings:* **1. Arctic aircraft operations 2. Ski-130 Hercules.**—*E.Z.S.*

12.8–244 551.507.361/2:551.510.42:523.51

Kells, M. C. and Keough, D. D. (*both, Poulter Lab.*), **Impact of high speed particles with solids and gases.** Stanford Research Institute, Menlo Park, California, Contract AF 19(604)-1892, Final Report, April 2, 1956–Sept. 30, 1958, Dec. 15, **1958.** 42 p. 25 figs., 6 tables, 3 refs., eqs. **DWB** (M(051) S785se)—Work performed under this contract has resulted in development of the first successful technique for providing quantitative measurement of hypervelocity cratering variables using particles of sizes less than about 150 microns. This has been accomplished by perfecting an explosive acceleration system in which deleterious blast effects have been eliminated, particle breakup has been minimized, and in which velocity measure-

ments do not affect the particle significantly. Large differences in craters produced by hypervelocity single particle impacts in plastics, metals and brittle materials were demonstrated. The usefulness of the explosive acceleration technique was further demonstrated by the calibration of two micrometeorite detector systems used in Aerobee rocket studies and in earth satellite studies. The calibrations obtained agreed well with those determined by the customary bead-dropping procedure. The explosive technique was further used to demonstrate that wire grid detector circuits will be opened by particles approximately half the wire diameter traveling with velocities in the 4–6 mmμ sec range. The feasibility of using shaped charges for micrometeorite simulation for upper atmosphere research was demonstrated in an Aerobee flight on Oct. 16, 1957. Charges were designed, prepared, and installed in the rocket to provide ionization sources for camera and radar studies. The charges produced the first man-developed objects to escape from the Earth's gravitational field. Preliminary studies were made on the ablation of steel in a nitrogen ion beam, and an apparatus was developed for studying light production when a microparticle impacts a target. *Subject Headings:* **1. Particle dynamics 2. Micrometeorite detector systems 3. Impact effects of high speed particles.**—*Authors' abstract.*

INSTRUMENTS (551.508)

See also: **Measurement of wind-drifted snow, Charcot Station** (Garcia), 12.8–47; **New spectrograph at the Haute-Provence Obs.** (Fehrenbach), 12.8–116; **Comparability of computed wind speed values from anemometer data** (Vorob'ev), 12.8–221; **Calculation of winter precip., Transvolga** (Razumikhin), 12.8–226; **Collection of aerosol samples** (Levin), 12.8–356.

12.8–245 551.508.25:535.33:546.11

Höglund, B. and Radhakrishnan, V., **A radiometer for the hydrogen line.** *Göteborg, Sweden. Chalmers Tekniska Hogskolas, Handlingar*, No. 223, **1959.** 24 p. 13 figs. (1 fold.), 7 refs. (*Research Laboratory of Electronics, Report*, No. 48.) **DWB, DLC**—A full description of a satisfactory instrument used at the Chalmers Wave Propagation Observatory at Onsala, near Gothenburg, Sweden, for hydrogen line observation. The new instrument was constructed in 1957 and consists of the antenna, the dipole, the receiver and calibration and switching systems. Diagrams of the switching systems and of the calibration equipment, as well as two typical hydrogen line profiles, are given. One of these profiles illustrates a major peak temperature of 100°K which is adopted as the standard of reference. This is encountered mainly in the region of the galactic plane and decreases to a few degrees absoluet at high altitudes. Details on each section of the instrument are included. *Subject Headings:* **1. Radiometers 2. Hydrogen lines.**—*N.N.* ⑤

12.8–246 551.508.71:53.089

Alianchikova, G. N., **Oborudovanie dlia ispytaniia i poverki priborov vlazhnosti.** [Equipment for testing and verifying humidity instruments.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Gidrometeorologicheskogo Priborostroeniia, Trudy*, No. 7:92–98, **1959.** 3 figs., table, 3 eqs. **DWB**—The author describes a thermohygric chamber for testing and verifying experimental apparatus at negative temperatures up to −55°C and for relative humidities between 20 and 100%. This chamber, which is illustrated by means of a diagram and whose operating principles are discussed with the aid of the relevant equations describing the physical laws of its operation has the following characteristics: the source of humidification and desiccation is a vapor generator included within the closed circulation systems. The variation in the maintenance of humidity within the working space is accomplished by variations in the temperature of the vapor generator. The maintenance of moisture is controlled in the case of negative temperatures by a condensation hygrometer whose mirror is cooled with semiconducting thermal elements. Also the construction and operation of an improved network hygrostat is described with the aid of a diagram and the appropriate formulas. Its characteristics are as follows: the variation of humidity in the warming compartment may be accomplished either by including a vapor generator in the closed circulation system or by including a humidifier and desiccator within this system; humidity is regulated either by periodic inclusion and exclusion

of an air blower by means of a semiautomatic or manual device or by the method of maintaining a constant temperature in the vapor generator during the continuous circulation of air. The psychrometer is moistened by means of a capillary pipette joined by means of a rubber tube to a reserve volume set up outside; different regimes of moisture variations can be established. *Subject Heading:* **1. Humidity measurement instruments.**—*I.L.D.*

12.8–247 551.508.71

Fateev, N. P., **Novy; avtomaticheski; kondensatsionnyĭ; gigrometr.** [New automatic condensation hygrometer.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 83:3–19, **1958.** 7 figs., 2 tables, 5 refs., 5 eqs. **DWB, DLC**—The design of a new automatic condensation dew point hygrometer equipped with a thermoelectric condenser for distant measurements or recordings of dew point and of the surrounding air temperature, both above and below zero temperatures and the method of using it are described. The high sensitivity and the small inertia of the hygrometer enables one to use it for the study of the distribution and variations of humidity in the lowest air layer, as well as for measurements made from airplanes or aerostats. It can be successfully used in observatories, especially in presence of negative temperatures. *Subject Headings:* **1. Dew point hygrometers 2. Automatic recording instruments.**—*A.M.P.*

12.8–248 551.508.71:536.423.45

Gokhale, N. R. and Gatha, K. M. (*both, Physics Dept. Inst. Science, Bombay*), **A new dew-point hygrometer.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(3):337–340, July **1959.** 2 figs. **DWB, DLC**—A new form of dew point hygrometer has been developed to measure accurately the relative humidity of air inside small chambers. Its construction, assembly inside Millikan's oil-drop apparatus and operation are described, and its comparative merits are discussed. *Subject Heading:* **1. Dew point hygrometers.**—*Authors' abstract.*

12.8–249 551.508.765 551.578.11:531.52

Shupiatskiĭ, A. B., **Forma i skorost' padeniia vodianykh i dozhdevykh kapel'.** [Shape and falling velocity of water and raindrops.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich.*, No. 5:798–800, **1959.** 3 figs., 2 refs. Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—An apparatus for measuring simultaneously the velocity and shape of artificial droplets and raindrops is described. It is based on the principle of induction. The velocity is measured by means of two induction rings and the shape and dimensions of the drops by the photoimpulse method. Measurements were carried out during thunderstorms in the summer of 1958 and are presented on graphs. It is shown that falling drops with a radius greater than 1.5 mm are usually not spherical. The degree of deformation of large raindrops was found to depend upon their volume. *Subject Headings:* **1. Drop measurement instruments 2. Raindrop size measurements 3. Raindrop velocities 4. Raindrop distortion.**—*I.L.D.*

12.8–250 551.508.765

Wiederholt, W. (*Berlin*), **Regentropfen mit Oberschallgeschwindigkeit.** [Rain drops at ultrasonic speed.] *Umschau*, Frankfurt, a.M., 60(2):38–39, Jan. **1960.** 4 figs., 2 foot-notes. German summary p. 38. **DLC**—The author describes an apparatus by means of which it is possible to propel the contents of a fluid cylinder about 1 mm in diameter and 20 mm long (a thick raindrop) upon an immobile rigid surface with a velocity of more than 4000 km/hr. The apparatus consists of a small injector of acid resistant steel containing about 0.01 cm^3 fluid and lightly closed off by an eoprene disk, which is driven suddenly into the injector by the bullet of an air-rifle so that the strongly compressed fluid shoots out of container as a very rapid jet. Three types of erosion are produced by the fluid drops depending upon the mechanical properties of the solid body. At first the target zone is deformed by the shear and pressure stress during the impact. Then an erosional deformation takes place by means of the stress effect of the fluid flowing transversely to the surface. In the third case deformation occurs as a result of the reflection of pressure waves from the free surface of the rigid body. These deformations produced on plexiglass, rubber and various metals are described with the aid of illustrations. *Subject Headings:* **1. Raindrop impact 2. Raindrop velocity measurement techniques.**—*I.L.D.*

12.8–251 551.508.82:621.317:551.511.33:551.551

Perepelkina, A. V., **Ob opredelenii turbulentnogo potoka tepla.** [Determination of turbulent heat flow.], *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, 7:1026–1035, July 1959. 6 figs., table, 10 refs., 16 eqs. Russian summary, p. 1026. **DWB, DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—The results of measurements of turbulent heat flux by direct (pulsation) method carried out at the Tsimlyansk Experimental Station are presented. The apparatus measured temperature and wind pulsations by means of a pulsation resistance thermometer and a pulsation anemometer. Both of these are linear so that the data can be worked up automatically by means of correlometer. The pulsation measurements are accompanied by gradient measurements. From an analysis of the data, it is possible to construct empirically in the first approximation a nondimensional function of the Richardson number which enters into the formula for determining heat flux (q) from gradient data. The case of unstable atmospheric stratification is investigated and the value of the constant $F\alpha$ for a boundary layer of free convection is close to the value proposed by PRIESTLEY. As far as a transitional regime is concerned the results differed from those obtained in Australia. *Subject Headings:* **1. Turbulent heat flow determinations 2. Pulsation resistance thermometers 3. Pulsation anemometers 4. Tsimlyansk.**—*Author's conclusion and I.L.D.*

12.8–252 551.508.822

Pauly, Egon (*Schleswig*), **Die Temperatur des Aneroids der Radiosonde H50 während eines Aufstieges.** [Temperature of the aneroid of the H50 radiosonde during an ascent.] *Annalen der Meteorologie*, Hamburg, 8(11/12):373–377, 1959. 8 tables, 2 refs., 2 eqs. German summary p. 377. **DWB, DLC**—The pressure recorded by an aneroid barometer deviates from the true values when operation and calibration temperature of the aneroid are different $\Delta p = \beta \cdot \Delta\tau \cdot (p_k - p)$ where β material constant, Δp = pressure correction, $\Delta\tau$ = calibration temperature minus operation temperature, p_k = effective compensation pressure, p = atmospheric pressure. In order to correct this error the operation temperature T_A of the aneroid must be known. It will differ from the external temperature $\Delta T = T_A - T_L$. The interior temperature of the aneroid of the radiosonde Graw H50 was measured during a series of ascents between Sept. 1958 and Jan. 1959. The aneroid was replaced by a bimetal. Radio reception of radiosonde ascent gave the course of the interior temperature, relative humidity and the external temperature. The height was recorded by radar; data are presented on the position of the tropopause and of the mean temperature gradient in the upper stratosphere during the radiosonde ascent; values of ΔT°C below and above the tropopause and values of ΔT up to and below 125 mb by day and night are presented. The aneroid was generally warmer by an amount ΔT than the external air. Only in the case of very strong and deep inversions and rapid increase in temperature above the tropopause is a reversal possible. Four groups exist for the differences aneroid-air temperature (ΔT), namely (1) from the ground to about 300 mb only the pressure appears as a variable; (2) above 300 mb a distinction is to be made between day and night; (3) from the tropopause to 125 mb the height of the tropopause is to be considered; and (4) from 125 mb and beyond the mean temperature variation γ in the layer considered is decisive. The temperature in the aneroid can be explained by delayed heat transition from the radiosonde structure into the interior. The inertia coefficient of the aneroid in regard to the equalization of its temperature with that of the external air is 5–6 min up to 300 mb, 7–8 min at 300–200 mb and 9–10 min above 200 mb. *Subject Headings:* **1. Radiosonde temperatures 2. Aneroid barometers 3. Temperature corrections on aneroids.**—*I.L.D.*

12.8–253 551.507.361:551.508.824:621.398

Von Wald, W. A., Jr. and Bridge, R. B., **The parachute-deliverable buoy-type automatic weather station.** *U. S. Naval Research Laboratory, NRL Report* 5272, May 12, 1959. 23 p. 29 figs. (incl. photos), table. **DWB** (M [055] U586r)—Weather information is often required from critical areas where routine meteorological observations are not made or can be made only at considerable expense. As part of a continuing program to develop means for obtaining meteorological data from remote or inaccessible regions, a free-floating, buoy-type automatic weather station has been developed which is capable of telemetering data over distances of thousands of miles continuously for several months. This buoy is housed in a case patterned

after an airborne torpedo, which permits an aircraft to deliver it by parachute to its operating locality with a minimum of modification to the standard equipment available aboard combat aircraft. Present models of the buoy contain sensors for air temperature, water temperature, barometric pressure, wind direction, and wind velocity, but the system is sufficiently versatile to allow a variety of other sensors and control equipments to be installed. As far as possible, the buoy has been built with commercially available equipment. This procedure grants to the system the advantages of lower cost and the greater reliability which can be expected of mass-produced equipment. The buoy transmits in International Morse code, in five-letter groups at intervals convenient for monitoring by conventional receiving equipment. Although the basic control sensing and telemetering instrumentation of the station could be incorporated in a much smaller buoy, the present size allows for a high degree of versatility as to instrumentation, coding system, service life, and addition of auxiliary functions. *Subject Headings:* **1. Automatic weather stations 2. Telemetering.**—*Authors' abstract.*

12.8–254 551.508.85

Familier, H. and Ginger, B., **Sur certains aspects des radars à modulation de fréquence.** [Concerning certain aspects of F.M. radar.] *L'Onde Electrique*, Paris, 40(398):372–382, May **1960.** 8 figs., 4 refs. **DLC**—The authors examined the problem of exact distance-measurements in modern radar installations using frequency-modulation. The checking of the frequency deviation of the transmitted wave is discussed in detail. A practical example demonstrates the order of magnitudes involved. *Subject Heading:* **1. Radar equipment.**—*Authors' abstract.*

12.8–255 551.508.85

Malkowski, G. (*Inst. f. Met. & Geophys. Free Univ., Berlin*), **Betriebserfahrungen mit dem Plathschen Sichtfunkpeiler SFP 51/2 bei der Sferic-Ortung.** [Operational experience with the Plath optical-path radio direction finder SFP 51/2 for the purpose of sferics location.] *Archiv für Meteorologie, Geophysik and Bioklimatologie, Ser. A*, Vienna, 11(3):392–402, **1959.** 7 figs. (incl. photos), 5 refs., eqs. German, English and French summaries p. 392. **DWB, DLC**—First experiences of operation of a cathode-ray radio; bearing-compass used for sferic-bearings are communicated. *Subject Headings:* **1. Radio direction finders 2. Sferics location.**—*Author's summary.*

12.8–256 551.508.85

Richter, R.; Bessis, J. and Catella, P., **Application au radar du phénomène de réflexion des ondes électromagnétiques par le sol.** [The ground reflection of electromagnetic waves in relation to radar.] *L'Onde Electrique*, Paris, 40(398):392–410, May **1960.** 34 figs., 3 tables. **DLC**—Examines the effect of the ground reflection of electromagnetic waves on the range of a radar station. After considering, in the first part article, the principal factors involved in the process of reflection and the effect of variations in them on radar coverage patterns, the authors have particularly examined, in the second part, scattered reflections and the effects which appear in the coverage patterns as the increased irregularities. They reach the conclusion that for ground-based radar, the free-space performance reappears when the ground irregularities have become very substantial. *Subject Headings:* **1. Radar equipment 2. Ground reflection electromagnetic waves effects on the range of a radar station.**—*Authors' abstract.*

12.8–257 551.508.953

Frie, Claude and Hahn, Harald, **Un spectromètre à transistors avec modulation de fréquence.** [A transistor spectrometer with modulated frequency]. *Académie des Sciences, Paris, Comptes Rendus*, 250(8):1471–1473, Feb. 22, **1960.** 4 figs., 3 refs. **DWB, DLC**—Description of a spectrometer equipped with transistors possessing a device of frequency modulation through variable capacity diode. Its performances are compared to those of an autodyne lamp lay-out, for a same utilization frequency of 30 MHz. Detailed description of the oscillator and detection process, and comments relating to the signal/noise ratio is given. *Subject Heading:* **1. Spectrometers.**—*A.V.*

SYNOPTIC ANALYSIS AND FORECASTING (551.509)

See also: **Fundamentals of long range forecasting** (Girs), 12.8–7; **Forecasting flood discharge, Maritime Territory** (Semlianskaia), 12.8–205; **Leningrad floods and their forecasting** (Grushevskiĭ, Lazarenko), 12.8–206; **Final Report 1956/1957 on Contract Cwb-9006** (Blue Hill Met. Obs.), 12.8–229; **Air pollution and the chemist** (Wilkinson), 12.8–280; **Formations of turbulent motion at fronts** (Gandin), 12.8–298; **High level turbulence** Clodman et al.), 12.8–336; **Orographic and dynamic influences during föhn** (Steinhäusser), 12.8–344; **Occurrence of late glaze storm** (Raevskiĭ, Kaushanskiĭ), 12.8–357; **Application of moisture exchange characteristics to precip. forecasting** (Grigor'eva, Drozdov), 12.8–360; **Estimating maximum possible precip., Calif.,** 12.8–368; **Application of statistics to the study of synoptic conditions of falling precipitation in Azerbaidzhan SSR** (Koshinskiĭ), 12.8–393.

12.8–258 551.509.313:551.515.21

†Berkofsky, Louis, **Numerical model for the prediction of hurricane formation.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 67, March **1960.** 30 figs., 36 refs., 89+eqs. **DWB, DLC**—A nongeostrophic flow model, in which the latent heat of condensation released through pseudo-adiabatic processes is the only heat source, is devised. An attempt is made to formulate initial conditions which resemble, as nearly as is known, the conditions existing prior to the formation of a hurricane. Using these initial conditions, the equations are solved on the IBM 704 electronic computer. Solutions are obtained with and without the latent heat of condensation in order to assess the importance of the heating for the development process. Solutions are obtained for three time steps (21 minutes). Even during this short period there are clear indications of the importance of latent heat. The vertical motions are about an order of magnitude larger, the horizontal temperature gradient is about one and one-half times as intense, and horizontal convergence is increasing much more rapidly, than when no heat is added. The pressure changes about the same amount in the case when heat is added as when no heat is added. This indicates a lag in the reaction of the pressure field to the addition of energy. It is estimated that the pressure field will react in 15 or 20 time steps. *Subject Headings.* **1. Hurricane formation prediction 2. Numerical models**—*Author's abstract.*

12.8–259 551.506.7:551.507.362.2:551.509.313

Holl, Manfred M., **The utilization of satellite observations in the theory and practice of numerical weather prediction.** Stanford Research Institute, Menlo Park, Calif., Contract AF 19(604)-5965, Technical Progress Report 2, Jan. 1–July 1, 1960. 15 p. 11 eqs.—The objective of the project is the development of mathematical expressions of the large-scale nonadiabatic heating in the atmosphere, designed primarily for incorporation in numerical models. The project is limited to the study of atmospheric radiation on a synoptic scale within the context of dynamic models and numerical weather prediction. Several avenues of investigation are required to bring about the objective as information is needed on the distribution of radiative heating and cooling, on the key radiative mechanisms, on the effectiveness of heating distributions on the motions, and finally on the formulations of somewhat simplified expressions tractable for inclusion in dynamical-numerical models. A systematic approach aimed at obtaining the needed information led to the breakdown of the project into the following tasks: 1) A survey of available knowledge of radiative processes on a synoptic scale, and sample calculations. 2) The study of the relationships of observations of the upward radiation flux from the atmosphere with the radiative processes within the atmosphere and the synoptic state. 3) Numerical experimentation with dynamical-numerical models containing the heating term. *Subject Headings:* **1. Numerical forecasting 2. Satellite observations for forecasting.**

12.8–260 551.509.313:551.509.33

Hwang, S. S.; Tang, M. M. and Dang, J. C. (*all, Dept. Meteorology, Nanking Univ.*), **A graphical month to month correlation method of long-range weather forecasting.** *Acta Meteorologica Sinica*, Peking, 30(4):306–315, Nov. **1959.** 4 figs., 8 tables, 7 refs. In Chinese; English summary p. 315. **DLC**—A method of long-range weather forecasting based on month to month correlation of weather elements is proposed. By this method, we can forecast a large number of monthly weather elements such as mean temperature, mean maximum temperature,

mean minimum temperature, absolute maximum temperature, absolute minimum temperature, total amount of precipitation, number of rainy days, clear days, days of over-cast, amount of insolation and etc. As this kind of forecast can be worked out many months before, so not only one month, but also seasonal or even half-year long-range weather forecasting can be made. Besides, this method can be applied also to make ten-day forecasting. *Subject Heading:* **1. Long range forecasting techniques.**—*Authors' abstract.*

12.8–261 551.511.32:551.509.312

Kurihara, Y. (*Met. Res. Inst., Tokyo*), **Numerical analysis of atmospheric motions.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 38(6):288–304, Dec. **1960.** 2 figs., 17 tables, 9 refs., 13 eqs. English summary p. 288. Japanese summary p. 304. **DWB, DLC**—In order to get fundamental and quantitative information on the primitive equation of motion, numerical analysis was performed for six ten-day periods by making use of six-hourly data of upper air observations at three stations in Japan. The average magnitude of each term in the equation is presented in Section 3 through 7 together with ten-day mean value of each term. Inertial force due to horizontal motion, *i.e.*, $-V.\Delta V$, is an important factor in the equation, and its magnitude in zonal direction is as much as in meridional direction at the levels lower than 400 mb. Magnitude of $-w\cdot\partial V/\partial p$ is somewhat small. Ten-day mean of $-w\cdot\partial u/\partial p$ suggests that zonal momentum is transported downward on the average at northern Japan. Acceleration derived from metric force is generally small, but the treatment of this term in time-averaged equation of motion meridional direction has to be done carefully. Coriolis force and pressure gradient are main factors in the equation. So far as this analysis is concerned, observed wind is subgeostrophic on the whole. Frictional acceleration in the free atmosphere was estimated as a residue of other terms in the equation. But no definite conclusion is obtained about it. Further study on frictional force is necessary. *Subject Headings:* **1. Atmospheric motions 2. Numerical analysis 3. Kinematics.**—*Author's abstract.*

12.8–262 551.509.313

*†Miyakoda, K. (*Tokyo Univ.*), **The methods of numerical time integration of one-dimensional linear equations and their inherited errors.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 38(6):259–287, Dec. **1960.** 38 figs., 13 refs., 7 eqs. English summary p. 259, Japanese summary p. 287. **DWB, DLC**—For solving one dimensional linear partial differential equations numerically, several methods are studied on the accuracy, the stability and the inherited errors of solutions. First, the time extrapolation scheme is discussed, and the 3 time-level method (the usual centered difference) and one of the 4-level methods are concluded to give satisfactory results. In particular, the latter is numerically stable even for the equation of frictional type. Second, concerning the formulas of approximating the space derivative by finite difference, the 3 gridpoint and the 5 gridpoint methods are examined. The differential equations treated involves the advection term, where the advecting flow is spatially variable. Namely, the term is consisted of the product of two space-dependent quantities, which produces new waves by their interaction. It is shown that the usual computing method, i.e., the "303 pt" method (3 levels for time and 3 points for space difference) gives rise to small scale errors, which turn out to be the ruggedness of the resulted pattern. On the contrary, the "3–5 pt" method is stable and much accurate for the equation excluding the friction term and the "4–5 pt" method for any kind of equations. The fictitious waves in small scale are extraordinarily small by these methods. The measures whereby one can expect the occurrence of the error are presented. They are derived from the difference between the differential and the difference equations, and they are related to the degree of the spatial undulation of the quantity concerned. Finally, using the techniques discussed, some sample calculations of 500 hr forecast are performed with respect to the patterns moving on a one-dimensional ringwise grid, and the numerical solutions are compared with the analytical solutions. *Subject Headings:* **1. Numerical time integration 2. Dynamics applied to forecasting.**—*Author's abstract.*

12.8–263 551.509.313:551.55

Nemchinov, S. V., **O reshenii uravneniia dlia prognoza polia atmosfernogo davleniia** [Solution of the equation for forecasting the atmospheric pressure field.] *Akademiia Nauk SSSR, Izvestiia, Ser: Geofiz.*, No. 12:1821–1830, Dec. **1959.** 4 refs., numerous eqs. Russian

ummary p. 1821. **DWB, DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—An approximate solution of the equation describing the variation of the field of atmospheric pressure is presented. In his purpose partial derivations along the vertical coordinate are replaced by finite differences. The system of differential inhomogeneous equations obtained in partial derivations with respect o two variables with constant coefficients is reduced to canonical form and is solved in a closed orm. The proposed method of solution allows the possible use of the most general assumptions egarding the atmospheric stratification and also the consideration of pseudoabatic processes in real atmosphere. *Subject Heading:* **1. Pressure field forecasting.**—*Translation of author's bstract: I.L.D.*

12.8–264 551.509.313:551.557.2

Pedersen, Kaare, **An experiment in numerical prediction of the 500 mb wind field.** *Geofysiske Publikasjoner*, Oslo, 21(8) March **1960.** 12 p. 7 figs., 2 tables, 5 refs. numerous eqs. English summary p. 1. **DLC**—Two 48 hr predictions of the geostrophic stream function at he 500 mb level are computed on one initial situation. One prediction uses the 4 point formula ommonly substituted for the Jacobian operator, the other uses an 8 point formula for the acobian operator. The prognostic equation is the barotropic vorticity equation with diverence. On the larger scales the two predictions are very similar. The displacements of six maller troughs, which are observed to have a "barotropic displacement," are studied. It is ound that their displacements in the prediction using the 4 point formula and in the prediction sing the 8 point formula on an average are 66 and 78% of the observed displacement respecively. *Subject Headings:* **1. 500 mb wind field 2. Numerical prediction 3. Geostrophic tream function.**—*Author's abstract.*

12.8–265 551.509.313:518.4

Sawyer, J. S., **Graphical output from computers and the production of numerically forecast r analyzed synoptic charts.** *Meteorological Magazine*, London, 89(1056):187–190, July **1960.** figs., 3 refs. **DWB, DLC**—Possible methods of graphical output from a computer are escribed. Mechanical graph-plotters are available in which a plotting head is moved over a hart on a table and selected symbols can be plotted or straight lines drawn. Any pagerinting device can be used to produce a map of isopleths by printing selected symbols in ppropriate places on the page but resolution is limited. A teleprinter can be used in this way ut a live printer is being used on Meteor. Interpolation and printing on the sample shown took bout one minute. Although Xerographic printers would be better suited to the printing of sopleth maps, they are very costly. Display of selected points on a cathode ray tube, illumiating a curve which can be observed or photographed. Difficulties in applying the latter are xplained. Unfortunately costs increase rapidly with processing speed. *Subject Headings:* **. Numerical forecasting techniques 2. Synoptic analysis 3. Computer uses.**—*E.Z.S.*

12.8–266 551.509.314:551.509.324.1

Matveev, L. T., **Ispol'zovanie empiricheskikh funktsiĭ vliianiia dlia prognoza granits blachnosti.** [The use of empirical influence functions for forecasting cloud base.] *Meteorogiia i Gidrologiia*, Moscow, No. 9: 11–15, Sept. **1960.** fig., table, 7 refs., 6 eqs. **DWB, DLC**—An empirical influence function is derived giving the forecast change in height of cloud base non-convective) in terms of the values at certain grid points of; (1) the advective variation f temperature and dew point, calculated by trajectory methods using the surface synoptic hart, (2) the Laplacian of mean sea level pressure multiplied by the difference in potential emperature between the surface and 850 mb and (3) the difference in dew point between the urface and 850 mb. The grid points used are the point for which the forecast is being made nd the corners and mid-points of the sides of a square of side 500 km with the forecast oint at its center. The results of the computation of the constants in the influence function r a 12 hr, forecast for Moscow are given. *Subject Headings:* **1. Cloud base forecasting . Empirical influence functions.**—*R.B.*

12.8–267 551.509.318:551.579.4:551.515(773)

Huff, F. A. and Semonin, R. G. (*both, Ill. State Water Survey*), **An investigation of flood-roducing storms in Illinois.** *Meteorological Monographs*, Boston, 4(22):50–55, May **1960.**

2 figs., 7 tables, 5 refs., eq. **DWB, DLC**—Meteorological conditions in major flood-producing storms of 1- to 10-day duration in Illinois are being analyzed. This paper presents the approach to the problem, progress to date, and preliminary results based on 2-day storms. During 1914 to 1957, 262 storms of 2-day duration in which the mean rainfall over 10,000 sq. mi was 1 in. or greater were analyzed, and area-depth relations were determined for each storm. The seasonal distribution of storms was obtained and it was found that 51% occurred during the summer months. The most frequent area of occurrence was found to be southeastern Illinois. A study of the orientations of the major axes of the storms disclosed that 71% of the storms were oriented within the sector from WSW–ENE to WNW–ESE. An investigation of synoptic conditions revealed that stationary fronts were associated with 27% of the most intense storms. The distribution of 3-, 6-, and 12-hr rainfall maxima for the 28 heaviest storms during 1948 to 1958 was examined. For storms of 24 hr duration or less, the 3-hr maximum began most frequently between 0000 and 0300 CST; the 6-hr maximum, at the same time; and the 12-hr maximum, between 1800 and 2100. A brief description of a synoptic model of these storms which evolved during the progress of this investigation is presented. *Subject Headings:* **1. Synoptic conditions for storms 2. Flood producing storms 3. Illinois.**—*Authors' abstract.*

12.8–268 551.509.322:551.551.5

Harrison, Henry T. (*Met. Dept., United Air Lines, Inc.*), **Progress in forecasting high level clear air turbulence.** *United Air Lines, Inc., UAL Meteorology Circular*, No. 52, March 1 **1961.** 24 p. 25 figs., table, 12 refs. **DWB**—This is a status report on progress being made about some of the complex problems associated with the forecasting of high level clear air turbulence. Geographical distribution of clear air turbulence cases (CAT) during 1960 is given. Variation of CAT with altitude, relation to jet stream core, and the role of vertical wind shear in forecasting are discussed. United Air Lines 1960 CAT forecasts are verified and forecast errors are analyzed. The last section sums up suggestions with regard to modification of 1959 CAT forecasting model. The report is extensively illustrated by maps and diagrams. 104 severe CAT cases from Jan. to June 1960 are tabulated in appendix I. *Subject Headings:* **1. Clear air turbulence forecasting 2. Upper air turbulence.**—*I.S.*

12.8–269 551.509.324.

Lugchenko, A. K. and Moshnikov, A. N., **Sostavlenie kart vysoty verkhneĭ granitsy oblakov nizhnego iarusa.** [On the construction of charts giving the upper boundary of a low cloud layer.] *Meteorologiia i Gidrologiia*, Moscow, No. 10:30–33, Oct. **1960.** 3 figs., table, ref. **DWB, DLC**—The height of the top of the cloud is considered to be the same as the top of the surface friction layer which is given by the formula $H=4\cdot 8c\sqrt{\theta_0/\gamma_a-\gamma}$ where c is the speed of the gradient wind, θ_0 is the potential temperature at the earth's surface and γ_a and γ are the dry adiabatic and actual lapse rates. Variations in θ_0 are found to be negligible and so constant value of $\theta=270°$A is taken. The preparation of the charts is carried out using only the surface and 850 mb. pressure charts. C is taken as the gradient wind at 850 mb. γ is computed from the formula $\gamma=100(T_8-T_0)/z_8-z_0$ where T_8 and T_0 are the temperatures at 850 mb. and at the surface and z_8 and z_0 are the heights of the 850 mb level and the surface. Nomograms are given to speed the calculations. Trials of the method over European Russia show that the height are given within an error of 30%. *Subject Heading:* **1. Forecasts of tops of layer cloud.**—*R.B.*

12.8–270 551.509.317:551.547:551.511.1

§Khandozhko, L. A., **O sutochnom khode geopotensial'nykh vysot izobaricheskikh poverkhnosteĭ.** [Diurnal variation of the geopotential heights of the isobaric surfaces.] *Meteorologiia i Gidrologiia*, Moscow, No. 11:40–42, Nov. **1959.** 2 figs., table. **DWB, DLC**—The author analyzed the daily variation of the geopotential heights of isobaric surfaces of 850, 700 and 500 mb during an anticyclone in the northern area of the European U.S.S.R. from July 10 to July 20, 1957. Fifteen stations at the periphery and in the central areas of the anticyclone were used. The semidiurnal variations of individual surfaces were averaged and compared on a graph with the daily variation of the geopotential altitudes. The daily variation of geopotential heights showed a marked daily variation of geopotential altitudes: from 1500 to 0300 o'clock they decreased and from 0300 to 1500 o'clock they increased; the daily variation was opposite to that of the pressure at the surface of the earth. The daily variation of altitude

orresponded to that of pressure at the earth's surface. The maximum values of daily variation f the absolute geopotential were observed at the 700 or 500 mb surface. The possibility of sing 12-hour variations of geopotential altitudes at the mean level in synoptic practice for orecasting pressure at the surface of the earth without excluding the effect of 24-hr variations, considered. As supplementary calculations of the 24-hr variations of altitude of the isobaric rface of 700 and 500 mb is necessary since on maps it is more suitable to put the 12-hr variaons in the numerator and the 24-hr variations in the denominator and to draw the isallohypses om the latter. When maps of basic topography are constructed for the third period the ariations of altitude should be computed from 2100 to 2100 o'clock and be put on maps of this eriod. In these cases only semidiurnal isallohypses are put on maps for 0300 and 1500 o'clock. *ubject Headings:* **1. Isobaric surface height variations 2. Surface pressure forecasting . European U.S.S.R.**—*I.L.D.*

12.8–271 551.509.324.1

Singleton, F. and Wales-Smith, B. G., **A note on cirrus forecasting.** *Meteorological Magazine*, London, 89(1053):101–105, April **1960.** 3 figs., 3 tables, 3 refs. **DWB, DLC**—A ew technique for forecasting cirrus for periods of 6–9 hrs and 24–36 hrs ahead has been sugested by D. G. James. Three of his questions may also be used to obtain an indication of igh cloud cover. They are: 1) Is the forecast area in the rear of a ridge in the 200 mb contour attern? 2) Is the area on the anticyclonic side of 200 mb jet stream? 3) Is the area up to 00 miles of a surface warm front? Following a preliminary trial of 50 days in 1957, 214 days in 958 were selected. After having obtained a 'score' relevant to the area and the period of forecast (Fig. 2) should give the most likely amount of cirrus. Fig. 3 shows the observations of verage amounts of cirrus on the 264 days of the present investigation. The investigation hows that there is an objective technique for forecasting amounts of cirrus as far ahead as ossible. *Subject Headings:* **1. Cirrus forecasting.**—*A.H.K.*

12.8–272 551.509.325:551.575

Legg, G. H. and Richards, T. L., **Forecasting advection-radiation fog at Malton Airport. Canada.** *Meteorological Branch, Cir*-3351; Tec-326, June 8, **1960.** 7 p. 4 figs., 3 refs. **DWB, DLC**—This paper reports a study made of fog occurrences over an eleven year period (1949 to 959) with a view to obtaining a graphical aid to forecasting the time of development of fog at Malton Airport. The modified George's Heating Radiation Fog Graph was applied to the 91 cases at Malton Airport when the visibility lowered to one half mile. The resultant diagram howed a completely random scatter. *Subject Heading:* **1. Advection-radiation fog forecasting.** —*I.S.*

12.8–273 551.511.3:551.515.23 551.509.327

Nishimoto S. (*Osaka District Met. Obs.*), **A dynamic theory on the displacement of a ircular model perturbation at the non-divergent level and its application to forecasting of the isplacement of typhoon.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 38(6): 05–313, Feb. **1961.** 9 figs., 4 tables, 20 eqs. English summary p. 305. Japanese summary . 313. **DWB, DLC**—Assuming that the barotropic vorticity equation $\frac{\partial \xi}{\partial t} + V \cdot \Delta(f+\xi) = 0$ is alid at the nondivergent level, the author discusses the displacement of a circular model erturbation superimposed on a basic motion and gives a generalized formula of Rossby's long ave theory. This theory is applied to the displacement of typhoon in the subtropical zone nd the author proposes a graphical forecasting method of typhoon movement. *Subject leading:* **1. Typhoon movement forecasting.**—*Author's abstract.*

12.8–274 551.509.33:551.509.5

Hofmann, Alfred (*Offenbach a.M.*), **Monatsvorhersage für Deutschland: Prüfungsergebisse aus den letzten 3 Jahren.** [Monthly forecasts for Germany: results of verifications in he last 3 years.]. *Meteorologische Rundschau*, Berlin, 13(3): 93–94, May/June **1960.** 3 figs., ible, 3 refs. **DWB, DLC**—Monthly forecasts by the Deutscher Wetterdienst (German Veather Service), valid for western Central Europe, show the possible temp. anomaly and data

for possible anomaly of the amount of precipitation. The verifications for 1957–1959 show a strong improvement of the quality of the forecasts compared to these for 1950–1955 as illustrated on a table. The frequency distribution of his sets as shown on the diagram, expresses much more spatial variability of precipitation contrary to that of temp. The distribution of his sets of temp. forecasts and of precipitation forecasts, as illustrated by charts, show the significance of temp. forecasts for Central Europe only with less frequency for precipitation forecasts. *Subject Headings:* **1. Monthly forecasts 2. Forecast verifications 3. Temperature forecasts 4. Precipitation forecasts 5. Germany 6. Central Europe.**—*O.T.*

12.8–275 551.506:551.553:551.509.52

*†Ellsaesser, Hugh W., **Wind variability.** *U. S. Air Weather Service, Technical Report* 105–2, March 10, **1960.** 91 p. 21 figs., tables, 92 refs., 26 eqs. **DWB** (M(055) U58a)—This report is designed to acquaint forecasters with the data on wind variability, the methods of evaluating it, and its application to forecasting and various operations. Available sources of data on wind variability for periods of one hour to several days are reviewed, evaluated and compared. Some of the data are summarized in graphical and tabular form. The dependence of the variability upon region, season, altitude, time period, synoptic conditions, and method of measurement is systematically covered. Statistical methods for representing variability, accuracy of the data, and causes of variability are also discussed. Some previous studies on applications of variability data in forecasting and operational problems are reviewed. An appendix provides guidance on how to apply the information in this report to practical field problems and gives several sample problems with answers worked out. *Subject Headings* **1. Wind variability data 2. Wind variability forecasting.**—*E.Z.S.*

ATMOSPHERIC STRUCTURE AND PHYSICS

ATMOSPHERIC COMPOSITION (551.510.41)

See also: **Transfer of radiant energy** (Sabolev), 12.8–8; **Carbon dioxide theory of climatic control** (London et al.), 12.8–373; **Hygienic investigation of effect of garages and pumps, situated in residential districts, on the local sanitary conditions of population** (Lampert), 12.8–382; **Transfer of radiant energy in steller and planetary atmos.** (Sobolev), 12.8–8.

12.8–276 537.56:551.510.4

Meek, J. M. (*Dept. Electr. Eng. Liverpool Univ.*), **Secondary ionization in humid air.** *Nature*, London, 183(4678):1805–1806, June 27, **1959.** fig., 7 refs., eq. **DWB**—Preliminary views on the measurements of air ionization in the presence of water vapor (15 mm ionization pressure) at low air pressure (150 mm) as well as the variables associated with it, and the over all effects of absorption which affects the coefficient of secondary ionization even in dry air, are discussed. These opinions are based on the works of Prasad and Craggs. *Subject Heading:* **1. Ionization of gases.**—*N.N.*

12.8–277 551.510.41:546.264:551.511.1

Kaplan, Lewis D. (*M. I. T.*), **The influence of carbon dioxide variations on the atmospheric heat balance.** *Tellus*, Stockholm, 12(2):204–208, May **1960.** 2 figs., 4 tables, 10 refs. eq. **DWB, DLC**—Net fluxes of radiation in the 15 micron carbon dioxide band at the top and bottom of the atmosphere have been calculated for several atmospheric models and with various cloud heights. The variation of the fluxes with carbon dioxide amounts is determined and its effect on temperature is discussed. Plass' estimate of a temperature drop of 3.8°C due to a halving of the carbon dioxide concentration appears to be too high by a factor of two or three. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Carbon dioxide variation 3. Atmospheric heat balance 4. Temperature drops.**—*Author's abstract.*

12.8–278 551.588.7:551.510.41:546.2

Lodge, James P., Jr.; Bien, George S. and Suess, Hans E., **The carbon-14 content of urban airborne particulate matter.** *International Journal of Air Pollution*, London,2(4): 309–31

June 1960. table, 6 refs. **DWB, DLC**—Very large samples of atmospheric particulate matter were collected in the central part of St. Louis, Mo. and Los Angeles, Calif. The carbon-14 content of various fractions of the samples was determined, and was interpreted in terms of the relative contributions of fossil fuels and contemporaneous sources of carbon to the particulate pollution of the area. It can be shown by this method, for example, that substantially all of the aliphatic hydrocarbons in the samples are of fossil origin, while about ¾ of the oxygenated materials are derived from living matter. The general applicability of the method is discussed. *Subject Headings:* **1. Atmospheric particulate matter 2. Carbon^{14} content of airborne particles 3. Atmospheric pollution.**—*Authors' abstract.*

ATMOSPHERIC POLLUTION (551.510.42)

See also: **Application of atmos. diffusion theory to public health** (Hašek), 12.8–90; **Impact of high speed particles with solids and gases** (Kells, Keough), 12.8–244; **Detection and determination of polynuclear hydrocarbons in urban airborne particulates, Pt. 1, the benzopyrene fraction** (Sawicki et al.), 12.8–383.

12.8–279 551.510.42:551.511.6:551.524.4

Spurr, G. (*Central Electricity Research Laboratories, Great Britain*), **The penetration of inversions by hot plumes. International Clean Air Conference, London, October 20–23, 1959, Proceedings,** pub. 1960. p. 234–235. table, 5 refs. **DLC**—It is possible to calculate the heat rate required in a chimney to ensure penetration of an inversion of known height and intensity. High chimneys are essential. Chimneys serving 100 MW of plant or more will penetrate the worst inversions. There is need for more information on inversions. *Subject Headings:* **1. Inversions 2. Turbulence 3. Atmosphere pollution.**—*Author's abstract.*

12.8–280 551.509.9:551.510.42(931)

Wilkinson, I. (*Dominion Lab., Christchurch, N. Z.*), **Air pollution and the chemist.** *New Zealand Institute of Chemistry, Journal,* 24(2):46–62, **1960.** fig., 6 tables, 10 refs. **DWB** (M10.42 W686ai)—This paper gives a descriptive account of the various factors that cause air pollution in urban areas and the chemical reaction of different substances in the atmosphere. The factors responsible for air pollution are enumerated as the growth of population, burning of coal, fogs, natural emissions and petrolium products. In order to elucidate the discussion some interesting statistics relating to air pollution problem in Los Angeles, London and Christchurch are discussed and graphically represented. The present state of our knowledge about the chemical reactions that occur in polluted air is summarized. At the end the magnitude of the air pollution problem in New Zealand is surveyed. *Subject Headings:* **1. Atmospheric pollution, New Zealand 2. Atmospheric pollution control.**—*I.S.*

TROPOSPHERE—STRATOSPHERE (551.510.52/3)

See also: **Diurnal pressure and temp. variations in the troposphere** (Matzke), 12.8–21; **N_2^+ ions in upper Antarctic atmos.** (Weill), 12.8–49; **Report of U. S. Commission 2 on Trop. Radio Propagation,** 12.8–111; **Correlation between diurnal pressure and temp. variations in the troposphere** (Matzke), 12.8–21; **Radio transmission by ionospheric and tropospheric scatter,** 12.8–113; **Astronomers in turmoil** (Struve), 12.8–117; **Statistical data for met. studies of upper atmos.** (Beelitz et al.), 12.8–235; **Propagation of planetary-scale disturbances from lower into upper atmosphere** (Charney, Drazin), 12.8–284; **Variation of coefficient of transparency of atmosphere during total eclipse of sun, June 30, 1954** (Fomenko), 12.8–315; **Wind variations in lower stratosphere** (Sawyer), 12.8–350; **Vertical propagation of a disturbance through the mesosphere** (Ooyama), 12.8–407.

12.8–281 551.506.7:551.510.528(691)

*Madagascar. *Service Météorologique.* **La tropopause à Tananarive.** [The tropopause at Tananarive.] Its *Publications,* No. 27, April **1959.** Mostly tables Statistical data relating to the tropopause based on observations made at Tananarive from Jan. 1, 1954 to Dec. 31, 1958. Absolute mean and extreme monthly values of the altitude of the tropopause, and correspond-

ing pressure, temperature and wind are given. Mean frequency in % of tropopause altitude occurring between certain given values and mean frequency in % of tropopause temperature comprised between certain given values and mean frequency in % of simultaneous occurrence between certain given values of wind speed and direction are discussed. *Subject Headings:* **1. Upper-air observations 2. Statistical data relating to the tropopause 3. Tananarive, Madagascar.**—*A.V.*

12.8–282 551.510.53 551.586:341.16:63

Robinson, Elmer, **Meteorology: newest region of exploration.** *Stanford Research Institute, SRI Journal*, 3:37–40, **1959.** figs., ref.—Discusses the relationship of meteorology and the atmosphere. The early French observations showed two layers of atmosphere. It was early in 1927 that stratosphere was opened to observation by the use of radiosonde. Recently, during IGY program, altitudes up to 90 thousand ft have been explored. But there is still a lot to be known about such phenomenon, as the rise of temperature at the height of a hundred thousand ft. In coming years, weather information is going to help solve the food problem for earth's expanding population. *Subject Headings:* **1. Meteorology 2. Radiosonde observations.**—*A.H.K.*

12.8–283 551.510.53:533.6

Grad, Harold (*New York Univ.*), **Equations of flow in a rarefied atmosphere.** *Rand Corporation, Santa Monica, (Publication)*, R-339, 1959. Paper No. 11 (37 p.). 4 figs., 11 refs., numerous eqs. **DWB** (M10.5 R186ae)—The problem of the aerodynamic or flow properties of the upper atmosphere is characterized by the presence of a large number of simultaneous and interacting phenomena and a vast range of values taken by the relevant physical parameters with an ensuing bewildering array of different flow regimes. As a working rule, one can hope to develop a non-trivial mathematical theory if at most one physical parameter (e.g. the Mach number) is allowed to range over all its values, and all other parameters (e.g. the mean-free-path) are taken to be either very small or very large. In the first part of this paper, we present a survey of some of the more interesting limiting cases, and we mention only briefly the multitude of transition regimes. In the second part we consider, as an illustrative problem, the "free flow" around an object much smaller than the mean-free-path. Surprisingly, whether or not this problem should be handled by the traditional free molecular flow techniques, or by continuum techniques, or as a problem in transition flow turns out to depend on what question has been asked. In particular, one can find in this single problem all the features of the various flow regimes for arbitrary Knudsen number as well as Mach number. The asymptotic flow at infinity can be described by an appropriate solution of the macroscopic non-dissipative Euler equations including a wake behind the body and a shock wave in the supersonic case. The fine structure of the wake is similar to the classical Oseen solution. Exactly the same asymptotic behavior is obtained for the flow around a body of arbitrary size (not in free flow). Thus the asymptotic flow depends on Mach number only and not on Knudsen number. *Subject Headings:* **1. Mach number 2. Aerodynamic theories 3. Flow in rarefied atmosphere.**—*Author's abstract.*

RADIO METEOROLOGY (551.562)

See also: **Items,** 12.8–109 to 12.8–113; **Obs. of low frequency radiation from upper atmos.** (Ellis), 12.8–140; **Radio astron. method for determining radio wave absorption** (Benediktov), 12.8–142; **Fading of low frequency radio waves** (Cilliers), 12.8–147; **HF radio wave propagation across auroral zone** (Fulton et al.), 12.8–149; **D1, D2 layers and absorption of radio waves** (Rumi), 12.8–157; **Ionospheric absorption** (Campbell, Leinbach), 12.8–168; **Analysis of 3-cm radio height-gain curves over rough terrain** (Tomlinson, Straiton), 12.8–392; **Optical and radio refractive indices and horizons-theory and application** (Williams), 12.8–394.

12.8–284 551.510.62:551.510.52 551.511:551.510.52

Charney, Jule G. (*M. I. T., Mass.*) and Drazin, P. G. (*Bristol Univ., Bristol, England*) **Propagation of planetary-scale disturbances from the lower into the upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 66(1):83–109, Jan. **1961.** 8 figs., table, 23 refs., 8 eqs

DLC—The possibility that a significant part of the energy of the planetary-wave disturbances of the troposphere may propagate into the upper atmosphere is investigated. The propagation is analogous to the transmission of electromagnetic radiation in heterogeneous media. It is found that the effective index of refraction for the planetary waves depends primarily on the distribution of the mean zonal wind with height. Energy is trapped (reflected) in regions where the zonal winds are easterly or are large and westerly. As a consequence, the summer circumpolar anticyclone and the winter circumpolar cyclone in the upper stratosphere and mesosphere are little influenced by lower atmosphere motions. Energy may escape into the mesosphere near equinoxes, when the upper-atmosphere zonal flow reverses. At these times tunneling of the energy through a reflecting barrier is also possible. Most of the time, however, there appears to be little mechanical coupling on a planetary scale between the upper and lower atmospheres. Tropospheric sources of wave disturbances in the zonal flow are baroclinic instability and the forcing action of zonally asymmetric heating and topography. The transmissivity of the upper atmosphere increases with wavelength and is greater for the forced perturbations than for the unstable tropospheric waves, whose lengths must be smaller than the critical length for instability. The analysis indicates that baroclinically unstable wave disturbances originating in the troposphere probably do not propagate energy vertically at all. When energy is propagated to great heights, nonlinear vertical eddy transports of heat and momentum associated with the vertically propagating waves should modify the basic zonal flow. However, when the wave disturbance is a small stationary perturbation on a zonal flow that varies vertically but not horizontally, the second-order effect of the eddies on the zonal flow is zero. *Subject Headings:* **1. Planetary-scale disturbances 2. Thermodynamics of the atmosphere 3. Eddy effects on zonal flow.**—*Authors' abstract.*

ATMOSPHERIC RADIOACTIVITY (551.510.7)

See: **Items**, 12.8–97 to 12.8–101; **Radioactive analysis of Vesuvius lava** (Vittozzi, de Martino), 12.8–180.

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE (551.511)

See also: **Transfer of radiant energy in stellar and planetary atmos.** (Sobolev), 12.8–8; **Radiation studies on south polar snowfield** (Hanson), 12.8–48; **Use of Richardson number in detecting aircraft bumpiness zones** (Zavarina, Iudin), 12.8–70; **Application of atmos. diffusion theory to public health** (Hašek), 12.8–90; **Waves through gases at low pressures** (Lighthill), 12.8–154; **IGY station, San Salvador** (Möller), 12.8–228; **Determination of turbulent heat flow** (Perepelkina), 12.8–251; **Numerical analysis of atmospheric motions** (Kurihara), 12.8–261; **Diurnal variation of geopotential heights of isobaric surfaces** (Khandozhko), 12.8–270; **Dynamic theory on displacement of circular model perturbation at non-divergent level and application to forecasting displacement of typhoon** (Nishimoto), 12.8–273; **Influence of carbon dioxide variations on atmospheric heat balance** (Kaplan), 12.8–277; **Penetration of inversions by hot plumes** (Spurr), 12.8–279; **Propagation of planetary-scale disturbances from lower into upper atmosphere** (Charney, Drazin), 12.8–284; **Structure of turbulence, O'Neill, Nebr.** (Deland, Panofsky), 12.8–334; **High level turbulence** (Clodman et al.), 12.8–336; **Wind variations in lower stratosphere** (Sawyer), 12.8–350.

12.8–285 532.533 551.511:551.513

Dady, G., **Caractères particuliers de la mécanique des fluides en météorologie.** [Particular characteristics of the mechanics of fluids in meteorology.] *La Météorologie*, Paris, Ser. 4, No. 56:263–271, Oct./Dec. **1959.** 9 refs. French, English and Spanish summaries. p. 263–264. **DWB**—Though the elementary and standard equations of the fluid mechanics hold good, the planetary character of the atmospheric fluid necessitates that its mechanics be treated in a particular manner. This planetary character leads a meteorologist to study the motions on a scale which is very different from that which interests other workers in the field of fluid mechanics. Moreover, these motions show a strong anisotropy. In comparison to these large scales, the smallness of the superficial forces with respect to the forces of mass or of volume is such that the force of inertia corresponding to the Coriolis acceleration (our axes are

attached to a rotating system) assumes a predominant character. These considerations allow to study the horizontal motion of the atmosphere separately and to represent it in the first approximation; it also permits to choose a function of current and not a velocity potential. The compressibility of the atmospheric air can be taken into account very simply without any fundamental modification in the equation valid for a incompressible fluid. The functioning of the atmosphere as a thermal machine appears to be a delicate proposition and just now it is difficult to assess the amount by which a theory introducing calorific balance sheet of the atmospheric particle will improve over understanding of the real atmospheric evolutions. *Subject Headings:* **1. Fluid mechanics 2. Mechanics and thermodynamics of the atmosphere.** —*Author's abstract.*

12.8–286 551.511.33:551.521

King, Jean I. F. (*Missile & Space Vehicle Dept. G. E. Co., Philadelphia*), **The Hopf *q*-function simply and precisely evaluated.** *Astrophysical Journal*, Chicago, 132(2):509–511, Sept. 1960. table, 2 refs., 14 eqs. **DWB, DLC**—Central to the equilibrium problem of radiative transfer is the accurate evaluation of $q(\tau)$, which expresses the variation with depth of the source function in a plane-parallel atmosphere. A set of three linear simultaneous equations with tabulated coefficients yields the solution with unexpected precision. We begin with the Schwarzschild-Milne integral equation for the source function, flux, and K-integrals at the top of a semi-infinite gray atmosphere in radiative equilibrium. The main value of this method is the fact that the constraint equations can be readily generalized to include non-gray absorption models. Radiative equilibrium configurations for non-gray finite atmospheres based on this integral constraint method will appear in a forthcoming paper. *Subject Heading:* **1. Radiative transfer.**—*E.Z.S.*

GENERAL CIRCULATION (551.513)

See also: **Particular characteristics of mechanics of fluids in meteorology** (Dady), 12.8–285; **Characteristics of air currents above the Pamirs and western Tian-Shan** (Morozova et al.), 12.8–391.

12.8–287 551.513.2:551.557.5

Mohácsi, Mária, **A futóáramlások néhány kérdéséröl.** [Some problems of jet streams.] *Időjárás*, Budapest, 63(3):178–180, May/June, 1959. 4 refs., 3 eqs. **DLC**—A survey of studies published on the significant qualities of the jet streams. The main regions of the jet streams are: 1) above the equator, 2–3) above the latitude 30° North and South, 4–5) between the latitude 40° and 60° on both hemispheres and continents above the subpolar areas. The discussion covers the phenomena observed in the five regions concerning altitude, velocity, direction, variability in space and time, the connection with synoptic systems and with temp., the description of wind-shear and turbulence along the jet streams. The practical usefulness of these observations is emphasized in the field of the aviation. The results already obtained are only the beginning and the author suggests that the future will bring many interesting scientific discoveries. *Subject Heading:* **1. Jet stream characteristics.**—*E.K.*

12.8–288 551.513.2:551.557.5(213)

Murray, R., **Mean 200-millibar winds at Aden in Jan. 1958.** *Meteorological Magazine*, London, 89(1054):156–157, May 1960. 2 tables. **DWB, DLC**—In Jan. the main feature of the long-period monthly mean chart at 200 millibars in the Middle East is the westerly subtropical jet stream across northern Arabia. In the mean there is a strong horizontal wind shear northwards from Aden up to the axis of the jet stream. In individual Jans. the position and intensity of the subtropical jet stream is critical as far as the winds at Aden are concerned. A displacement of the subtropical jet stream a few degrees northward of its average position will result in mean wind at Aden being some 10 knots weaker than average, whereas an equal southward displacement will result in the monthly mean wind being 20–30 knots stronger than average. *Subject Headings:* **1. Monthly mean winds 2. Mean 200 mb winds 3. Subtropical jet stream 4. Aden 5. Arabia.**—*E.Z.S.*

ATMOSPHERIC DISTURBANCES (551.515)

See also: **Violent storms** (Battan), 12.8–28; **Atmos. fronts, Antarctica** (Astapenko), 12.8–50; **Numerical model for prediction of hurricane formation** (Berkofsky), 12.8–258; **Investigation of flood-producing storms in Illinois** (Huff, Semonin), 12.8–267; **Dynamic theory on displacement of circular model perturbation at non-divergent level and application to forecasting displacement of typhoon** (Nishimoto), 12.8–273; **Variation of oceanic conditions, N.W. Pacific** (Fukuoka), 12.8–330; **Structure of sea breeze front** Wallington), 12.8–341; **Electric field of a large dust devil** (Freier), 12.8–405.

12.8–289 551.515.12:551.577.2

Thomas, T. M. (*Ministry of Housing and Local Government, Cardiff*), **Precipitation within the British Isles in relation to depression tracks.** *Weather*, London, 15(11):361–373, Nov. 1960. 5 figs., 2 tables. **DLC** (QC851.W4)—Generally precipitation from a typical polar-front depression can be split into frontal type rain ahead of the warm front or occlusion, orographic precipitation within the warm sector and instability type to the rear of the cold front. The precipitation features for each of the depression types described in an earlier paper (*Weather*, 15(10)) have been analyzed on the basis of this general picture to show the normal precipitation pattern as it affects the various geographical regions of the British Isles. *Subject Headings:* **1. Polar fronts 2. Depressions 3. Precipitation 4. British Isles.**—*R.B.*

12.8–290 551.515.13:551.577.21(47)

Faĭnergol'ts, I. N., **Nekotorye rezul'taty rascheta znachitel'nykh osadkov po Khar'kovskoĭ oblasti pri vykhode iuzhnykh tsiklonov.** [Some results of the calculation of significant precipitation amounts in Kharkov Province during the exit of southern cyclones.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 10:93–98, **1959.** 2 tables, 6 refs. **DWB, DLC**—After a discussion of the general features of southern cyclones causing significant but light precipitation in Kharkov province, the author analyzes the main factors of precipitation in the cold and warm seasons. Further, he shows the results of precipitation precalculations made according to the method of A. A. Bachurina and G. H. Turketti, which are presented in a table and are compared with factual precipitation amounts. It has been shown that continuous and intensive precipitation is caused by horizontal temperature contrasts in passing cyclones in the lower troposphere in the limits of 16–24 dkm/1000 km. Such cyclones are already high pressure formations and their spatial axis is almost vertical. The movement speed of cyclones amounts to 15–30 km per hr; sometimes they are stationary. This is the cause of prolonged and intensive precipitation. *Subject Headings:* **1. Cyclonic activity 2. Precipitation predictions 3. Kharkov, Ukrainian S.S.R.**—*A.M.P.*

12.8–291 551.515.13

Thomas, T. M. (*Ministry of Housing and Local Government, Cardiff*), **Some observations on the tracks of depressions over the eastern half of the North Atlantic.** *Weather*, London, 15(10):325–336, Oct. 1960. 5 figs. **DLC** (QC851.W4)—15,000 working charts of the Meteorological Office have been scrutinized and classified into seven main types. The types are: A). polar-front depressions with E to SE'ly track; B). polar front depressions with NE'ly component to their track; C). detached depression not belonging to a typical polar-front family; D). deep depressions which become quasi-stationary; E). secondary depressions forming at tips of wave of trailing cold fronts; F). secondary depressions which develop in frontal troughs and G). polar air depressions. Most of the main groups are split into two or three subsections. The frequencies of the depressions for a typical year of the various types which contribute to the annual rainfall of the British Isles are as follows A—10, B—70 to 80, C—8 to 12, D—5 to 8, E—25 to 30, F—20 to 25 and G—25. The basic features of each of the types are discussed. It is hoped later to examine their effect on the rainfall of the British Isles. *Subject Headings:* **1. Depressions 2. Eastern Atlantic.**—*R.B.*

12.8–292 551.506.1:551.515.2

Davis, Walter R., **Hurricane season of 1958.** *Weatherwise*, Boston, 12(1):17–23, Feb. **1959.** 3 figs. **DWB**—The hurricane season of 1958 in the Gulf of Mexico, the Caribbean Sea, and the Atlantic Ocean produced a total of 10 tropical storms, seven of which reached full

hurricane intensity. The season could be considered about normal, as far as the number of storms is concerned. Four tropical storms affected the U. S. mainland during the hurricane season. Tropical storms Alma and Ella passed into Texas and hurricanes Daisy and Helene skirted along near and off of the coasts of the Atlantic states. Tropical storm activity was concentrated in the Atlantic this season, with recurvature to the north and northeast before passing inland over the Atlantic states. About the middle of October a complete reversal of the planetary trough-ridge system over the northern hemisphere occurred. This change resulted in a split jet over Florida flooding that area with polar air. Tropical cyclone development which had been quite active since early in August, abruptly terminated. A summary of the individual tropical storms and hurricanes of 1958 is given and photographically illustrated. *Subject Heading:* **1. Hurricanes—1958.**—*I.S.*

12.8–293 551.515.2:06

Gentry, Robert Cecil (*Dir. Natl. Hurricane Proj. Miami*), **Review of recent hurricane research.** *Weatherwise*, Boston, 13(5):206–209, Oct. **1960.** fig. **DWB**—Recently there has been great progress in the work of hurricane research. The West Indies network was strengthened by the establishment of a new station at Bogota, Colombia. It is expected that series of observations over the Caribbean will provide information on the important problems of radiation process. A recent experiment at Miami was conducted to find out whether air motions in the lower and upper layers of troposphere can be used to ascertain the occurrance of rainfall. Recently, some storm studies in the Florida area show that hurricanes have occurred in the homogenous air. *Subject Heading:* **1. Hurricane research programs.**—*A.H.K.*

12.8–294 551.501.81:551.515.2

Japan. Meteorological Agency, **Scientific Report No. 2 (prepared under contract with the U. S. Weather Bureau, National Hurricane Research Project).** Tokyo, **1960.** 42 p. Contents: Japan. Meteorological Agency, **Composite radar picture of typhoon Amy in 1959 and its synoptic study,** p. 1–33. 20 figs., 4 refs. Doi, Kenji, **Radar network for typhoon tracking in Japan,** p. 34–42. 8 figs., 5 refs. **DWB** (M(051) M589sci)—The reason for making a composite radar picture is to study the possibility of utilizing the nationwide radar network information for weather analysis and also to study the nature and behavior of precipitation systems which were accompanied by typhoon "Amy." Radar echo information collected nationwide or on continental scale was very helpful in knowing the brief orientation of frontal system rather than to obtain the exact location. The precipitation echoes associated with this typhoon, which was becoming extra tropical, showed very interesting features, such as the development of squall line just after the typhoon became extra tropical cyclone. A very handy and simple technique to make the composite radar picture is also developed. During 1959, the Japan Meteorological Agency established New radars in two islands, both located in the southwest region of Japan, where the typhoons pass most frequently. Though the operation of these island radars has just started, their possible contribution to the establishment of a typhoon tracking network as well as to the study of the storms are discussed. *Subject Headings:* **1. Typhoon Amy 2. Typhoon tracking 3. Radar typhoon tracking in Japan.**—*from Authors' abstract.*

12.8–295 551.515.2:629.12

Rodewald, Martin (*Seewetteramt, Hamburg*), **Hurricane Carrie and the Pamir disaster.** *Weather*, London, 12(10):337–379, Oct. **1958.** 8 figs., table, 6 refs. **DWB, DLC**—The German training vessel Pamir, one of the last "flying P-liners." met its tragic end on 21 Sept. 1957, when caught in the track of Hurricane Carrie, the most intense tropical storm of 1957. The present account of the disaster emphasizes the meteorological aspects and makes some remarks concerning the problems of meteorological navigation with respect to hurricanes. Graphical illustrations appear with the text; one showing the track of Carrie and route of the Pamir is of special interest. The discussion traces at length the long life history and the peculiar and erratic track of this hurricane. In the end a possible explanation for east-south-easterly track is given and graphically illustrated. *Subject Heading:* **1. Hurricane "Carrie" (1957) 2. Navigation in hurricanes.**—*I.S.*

12.8–296 551.506.3:551.515.2(263)

U. S. Navy. Fleet Weather Central, Miami, **Annual report of hurricane season, 1958.** Its *OPNAV Report* 3140-9, issued (1959?). Each section (storm) repaged. numerous figs. and charts. On cover-title: U. S. Fleet Hurricane Forecast Facility, Annual tropical storm report, 1958. For abstract on 1955 and 1957 Reports, *see* 9.11–28, Nov. 1958, *MAB*. **DWB** (M15.2 U585as 1958)--Evaluation of forecast techniques used in preparation of advisories and warnings of hurricanes during 1958 including verification data for direction, speed and distance, a summary of hurricane activity and description of each individual storm, its trajectory, positions at numerous "fixes," and methods used in correcting deficiencies, are set forth in detail with numerous tables, graphs, charts, maps, nomograms, radar photos, etc. There were 7 hurricanes and 3 tropical storms in 1958 (from "Alma," June 14–15 to "Janice," October 5–13, 1958) in the Atlantic area. *Subject Headings:* **1. Annual hurricane reports 2. Hurricane analyses—1958 3. Hurricane season reports 4. Caribbean.**—*M.R.*

12.8–297 551.515.23

Der Taifun "Isewan" (Vera). [Typhoon "Isewan" (Vera.)] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(12):467, Dec. **1959. DWB, DLC**—The typhoon "Isewan" (Vera) coming from the southwest struck Cape Shio, the southern tip of the Ki peninsula at 0500 o'clock on Sept. 26, 1959. The "eye" of the typhoon described a line in a north northeast direction just west of Nagoya. The east to west vortex winds rotating in a circumference of 700 km devastated the prefectures of Mie, Naza, Aichi and Gifu. The typhoon reached Nagoya shortly after 2100 o'clock. The first wave over the harbor wall was 4 m high. The Shonoi and Hori Rivers burst their dams. The rainfall from Sept. 25 to Sept. 27 amounted to 165.7 mm. The barometric pressure was 929.7 mb at 1820 o'clock, Sept. 20. The wind velocities averaged 45–50 met/sec. This typhoon was the third strongest typhoon over Japan since 1889. *Subject Headings:* **1. Typhoon movement 2. Typhoon "Isewan" (Vera) (1959).**—*I.L.D.*

12.8–298 551.509.318:551.551.5:551.557:551.515.8

Gandin, L. S., **Ob obrazovanii turbulentnykh dvizheniĭ na frontakh.** [Formations of turbulent motion at fronts.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 76:61–81, **1958.** 6 figs., 9 refs., 64 eqs. **DWB**—The author describes the two approaches to the study of the meteorological conditions of bumpiness, namely the isolation of synoptic conditions associated with bumpiness and the determination of the quantitative properties of the atmosphere which are not closely associated with bumpiness such as the Richardson number. In case of bumpiness at fronts, where the Ri number is no longer applicable it is necessary to visualize an ideal transition layer in the form of a front in determining the criteria of turbulence. The basic hypothesis assumed is that turbulence at surfaces of separation is associated with a disturbance of the stability of short waves at the surface; hence the problem is reduced to determining stability criteria of such waves. The initial equations of small wave disturbances are developed under the simplifying assumptions that Coriolis force is non-existent and that an adiabatic motion in an ideal fluid does exist. A mathematical theoretical discussion is presented; (1) of the limiting height conditions for the progressive waves being analyzed; (2) of the order of magnitude of different terms in the equation expressing the wave motions in a surface of separation; (3) of waves at the surface of separation when the influence of statistical stability is slight; (4) of the criteria of stability, of the frequency equation for a general case; (5) of the direction of propagation of disturbances; and (6) of the influence of substitution of the transition layer of the separation surface. On the basis of experimental data of bumpiness at fronts attained by J. S. SAWYER (*Geophys. Mem. Met. Office No.* 96, 1955), the author presents nomograms for determining the critical wave length. *Subject Headings:* **1. Bumpiness 2. Synoptic conditions for bumpiness 3. Wave motions.**—*I.L.D.*

12.8–299 551.515.8:551.576.2/4:551.507.352(571)

Sovetova, V. D., **Vertikal'noe raspredelenie oblakov v zone frontov nad Zapadnoĭ Sibir'iu.** [Vertical distribution of clouds in frontal zones over West Siberia.] *Meteorologiia i Gidrologiia*, Leningrad, 6:21–25, June **1959.** 5 tables, 2 refs. **DWB, DLC**—The results of various statistical analyses of the vertical distribution of frontal cloudiness over Western Siberia during the

period Oct.–April are presented. These are based upon airplane soundings of the atmosphere carried out at Sverdlovsk, Omsk and Novosibirsk during 1952–1958. Data are presented on the frequency (in %) of different height of upper boundaries of frontal cloudiness for each point in the case of warm fronts, cold fronts, occluded front and stationary fronts; frequency (in %) of different cloud layer thicknesses (without Ci, Cs Cc), frequency (in %) of different thicknesses between cloud layers (without Ci, Cs Cc), frequency (in %) of the upper layer at different distances from the frontal line and the distribution (in %) of the heights of the upper layer. The significance of this distribution of frontal cloudiness to jet flights is discussed. *Subject Headings:* **1. Frontal zones 2. Cloudiness regime 3. Frontal cloud 4. Western Siberia.**—*I.L.D.*

12.8–300 551.515.8:551.551.5

Wilkie, W. R. (*Bureau of Met., Brisbane*), **The Showalter index and associated weather.** *Australian Meteorological Magazine*, Melbourne, No. 28:1–12, March **1960.** 5 figs., 2 tables, 2 refs. **DWB**—At Queensland radio-sonde stations for the period Sept. 1957 to May 1958, stability indices for 800 aerological soundings indicative of the air mass types over the State were compared with subsequent weather, and classified into air mass and frontal types. The resulting frequency analyses for the respective stations are given in tabular and graphical forms. The particular value of the use of stability indices for "border-line" cases is discussed, and some suggestions given for forecasting changes in stability index. *Subject Headings:* **1. Showalter's Stability Index 2. Air masses and fronts 3. Frontal frequencies.**—*Author's abstract.*

RADIATION AND TEMPERATURE

RADIATION (551.521)

See also: **Transfer of radiant energy in stellar and planetary atmos.** (Sobolev), 12.8–8; **Actinometric obs. for the Soviet IGY program** (Pivovarova, Pleshkova), 12.8–36; **Atmos. net radiation flux, Thule** (Fenn, Weickmann), 12.8-40; **Symposium on radiation, Oxford** (Kondrat'ev), 12.8–55; **Outbursts of solar radio emission** (Vitkevich, Kameneva), 12.8–120; **Radio spectrum of solar activity** (Maxwell), 12.8–135; **Drift frequencies for geomagnetically trapped particles** (Hamlin et al.), 12.8–161; **Distribution of geomagnetically trapped protons** (Singer), 12.8–163; **Computing diffuse and global radiation** (Goïsa), 12.8–219; **Hopf q-function simply and precisely evaluated** (King), 12.8–286; **Variation of percentage of recent Japanese sunshine hours** (Tsuchiya), 12.8-381; **Optical and radio refractive indices and horizons-theory and application** (Williams), 12.8–394.

12.8–301 551.506:551.521:523.78

*Hinzpeter, H. and Wörner, H., **Die Strahlungsmessungen in Potsdam und Persnäs.** [Radiation measurements in Potsdam and Persnäs.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Veröffentlichungen*, No. 16:5–23, **1955.** 6 figs., 2 tables, eqs. **DWB, DLC**—Measurements were made during solar eclipse on 30 June 1954, including intensity of direct solar radiation, turbidity, red and yellow ratio, polarization and with without red or blue filter and the zenithal light density. Cloudiness affected the result. *Subject Headings:* **1. Solar eclipse, June, 1954 2. Radiation measurements 3. Potsdam, Germany 4. Persnäs, Sweden.**—*A.A.*

12.8–302 551.521(573)

Verle, E. K. and Svinukhov, G. V., **Radiatsionnyĭ balans territorii Primorskogo kraia.** [Radiation balance of the Maritime Territory region.] *Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 6:30–42, pub. Leningrad, **1958.** fig., 13 tables, 5 refs. **DWB**—The radiation balance for the maritime territory was computed on the basis of data from 38 stations distributed more or less evenly in the maritime territory. In the absence of actual radiation measurements the radiation balance was calculated by means of the equation: $R=(Q+q)(1-\alpha)=E$ where $(Q+q)$ = total radiation, α = integral albedo of the underlying surface and E = effective outgoing radiation. The total radiation was

omputed by the equation $(Q+q)=m\Sigma S+n$ for stations with data on sunshine duration Σs=duration of sunshine measured with a heliograph; m and n=coefficients developed by . N. Ukraintseva) and $(Q+q)n=(Q+q)_0[1-(1-k)n]$ for stations without data on sunhine duration; $(Q+q_0)$=total radiation for a cloud free sky; k=coefficient indicating proporion of solar radiation impinging upon the upper boundary of the clouds and arriving at the arth's surface during complete cloud cover, n=mean amount of cloud cover). Albedo was etermined by the method proposed by T. G. Berliand. Data on radiation extinctions were btained from values of total radiation and albedo of different surfaces. Effective radiation as measured by the equation: $E=0.95\,\sigma T^4(0.194+0.236^{-0.69\cdot1})(1-0.76n)$ where T=absolute emperature, e=absolute humidity, in mm, n=mean cloudiness in tenths and σ=Stefan-Boltzmann constant equal to $8.26.10^{-11}$ cal/cm² min drg. The computed radiation balance hows a negative radiation balance for Nov., Dec., Jan. and Feb. and a positive one for the emaining months. The radiation balance ranges between 21.7 (Akzu) and 46.1 (Vladivostok) cal/cm². Data on measured and computed radiation for Vladivostok, monthly and annual otal radiation for each station albedo, radiation extinction and imported radiation balance re presented. *Subject Headings:* **1. Radiation balance data 2. Maritime Territory, Soviet Far East.**—*I.L.D.*

12.8–303 551.506:551.521.1:551.521.16(569.4)

*Ashbel, Dov (*Dept. of Met., Hebrew Univ., Jerusalem*), **Global solar radiation (gram alories/CM²) and day-light (in kilolux hours) in Jerusalem, Oct. 1956.** Jerusalem, **1956.** 0 p. ref. entirely tables. On t-p: "2." **DWB**—Report contains tables of hourly global olar radiation data (gr Cal hour/cm²) for each day of each month from Jan. 1953–Sept. 1956; iffuse sky radiation for June 1956–Sept. 1956; mean hourly global radiation (sun and sky) n a horizontal surface g cal/cm² hour); mean hourly global solar radiation for each month of 955–Sept. 56; global infrared and red radiation on horizontal surface (1954–56); mean hourly lobal normal incidence daylight (sun and sky) in Kilolux hours (1955–56); mean hourly lobal amount of daylight on horizontal surface (1954–56), and diffuse light on normal and in orizontal surface. *Subject Headings:* **1. Global radiation data 2. Daylight data 3. Jerualem, Israel.**—*M.R.*

12.8–304 551.521.1:551.576.2

Berg, Hellmut, **Sulla radiazione globale a Mogadiscio.** [Global radiation at Mogadiscio.] *Geofisica e Meteorologia*, Genoa, 6(3/4):46–48, **1958.** 3 figs., 3 tables, 3 refs. German and English summaries p. 48. **DLC**—The global radiation measurements made in Mogadiscio ith a Robitzsch-Fuess pyranograph during Second International Polar Year (1932–1933), re analyzed in relation to cloud cover, type of clouds, visibility, blueness of the sky and easonal variation. The relationship between cloudiness or sunshine duration and global adiation is linear in the range of zero and six tenths cloudiness. The annual variation of lobal radiation shows a maximum in March; the global radiation varies slightly between une and Oct. but it increases slightly between Nov. and Jan. and greatly in Feb., March and pril. The blue of the sky does not show any relationship to global radiation. A close elationship between horizontal visibility and global radiation does not exist in Mogadiscio. Neither of these last two elements allows a clear subdivision of the year in conformity with the onsoon regimes (where Nov.–Feb. is the NE monsoon and May–Sept. the SW monsoon). Only the relative humidity distinguishes the two monsoonal seasons. The increased values of lobal radiation during Feb.–April in Mogadiscio is associated with the diminished frequency f Ac and As clouds. A cloud cover of Cu or Cb by reflecting radiation increases perceptibly he radiation of the sky to a greater degree than the same amount of cloudiness (in tenths) f ten reflecting clouds such as As and Ac. *Subject Headings:* **1. Global radiation data . Cloudiness effects on insolation 3. Mogadiscio.**—*I.L.D.*

12.8–305 551.521.1:574

Cole, LaMont C., **The ecosphere.** *Scientific American*, N. Y., 198(4):83–92, April **1958.** figs. **DWB, DLC**—The ecosphere is the sum total terrestrial community of plants and nimals or organisms and its environment, or a combination of the biosphere and the ecoystem. The community consists of accumulators of energy, primary consumers, secondary

consumers, and decomposers. Outside energy sources (light, cosmic radiation and meteors) and internal energy sources (radioactivity, tidal friction, fossil fuels) are considered. Sunshine provides 99.9998% of total energy income or 13×10^{23} gram cal/year, $\frac{1}{3}$ of which is reflected back to space. About .04% goes to provide the energy requirements of the biosphere, mostly by photosynthesis. One-sixth of this energy goes to plants own metabolism and $\frac{5}{6}$ are available for other animals and plants, and 5% is dissipated in fires. One meter of water is evaporated each year from oceans, land evaporation is $\frac{1}{6}$ of total from sea and $\frac{1}{5}$ of this is evapotranspiration. Runoff is about $\frac{1}{10}$ the evaporation of the precipitation equals the sum of the two. Main elements in earth and atmosphere and sea are shown graphically. *Subject Headings:* **1. Ecosphere 2. Solar energy budget 3. Evaporation.**—*M.R.*

12.8–306 551.521.1(944)

de Vries, D. A. (*Div. of Plant Industry, C.S.I.R.O., Deniliquin, N. S. W.*), **Two years of solar radiation measurements at Deniliquin.** *Australian Meteorological Magazine*, Melbourne No. 22:36–49, Sept. **1958.** 2 figs., 4 tables, 9 refs., 3 eqs. **DWB**—Results of solar radiation measurements at Deniliquin (35°32′S, 144°58′E) during the period March 1956 to Feb. 1958 by means of a Moll-Gorczynski solarimeter are presented and analyzed. The daily totals of radiation intensity on a horizontal surface (Q) are correlated with hours of bright sunshine (n measured with a Campbell-Stokes instrument) and fractional cloudiness (m) by the equations $Q/Q_A = 0.27 + 0.54\, n/N$, $Q/Q_A = 0.83 - 0.45\, m$, where Q_A is the calculated intensity on a horizontal surface at the upper limit of the atmosphere and N the maximum possible hours of bright sunshine. The present results are compared with other radiation measurements in Australia. *Subject Headings:* **1. Solar radiation intensities 2. Deniliquin, Australia.**—*Author's abstract.*

12.8–307 551.521.1(236.7)

*Dirmhirn, Inge (*Vienna*), **Über einige Messungen der Globalstrahlung im Ruwenzori-gebirge (Zentralafrika).** [Measurements of global radiation in the Ruwenzori mountains (Central Africa).] *Wetter und Leben*, Vienna, 7(12):298–301, **1955.** 2 tables, 6 refs. **DLC**—The measurements of global radiation were made during the interval July 27–Aug. 12, 1955. They were made with a Stern pyranometer. Data are given on the mean daily variations of global radiation for clear and very cloudy skies from measurements at 4500 mm for the period at the end of July, beginning of Aug. 1955 and daily variations of global radiation for clear skies at Stanleyville and Nairobi in cal/cm² min. Also a description of the climate of the Ruwenzori Mountains is given. *Subject Headings:* **1. Global radiation measurements 2. Ruwenzori Mountains, Central Africa.**—*I.L.D.*

12.8–308 551.521.1(62)

Elnesr, M. K. (*Physics Dept., Cairo Univ., Giza, Cairo, Egypt*), **On the evaluation of solar radiation in Egypt.** *Geofisica Pura e Applicata*, Milan, 40:247–251, **1958.** 2 figs., 2 tables, 12 refs. **DWB**—A study of the depletion of solar radiation at Helwan Observatory has shown for Egypt, that: a) diffuse reflexion and absorption by suspended particles in the atmosphere constitute about 20% of the total depletion; b) absorption by water vapour is the only factor that should be evaluated at any place to give an estimation of the solar radiation received at that place. This can be obtained either from the mean values of the surface water vapour pressure which have been considered in detail, or, for individual cases, from spectroscopic measurements of the precipitable water content whose daily variations have been studied. *Subject Headings:* **1. Solar radiation calculations 2. Helwan, Egypt.**—*Author's summary.*

12.8–309 551.521.1:551.58

Fukui, E. (*Tokyo Kyoiku Univ.*), **Amount of solar radiation in a zonal area between two parallels of latitudes.** *Geophysical Magazine*, Tokyo, 28(4):449–455, Sept. **1958.** 2 figs., 4 tables, 3 refs., 8 eqs. **DWB, DLC**—Some ten years ago, the late Professor T. Okada presented a noticeable idea concerning the possibility of cool-highland agriculture. According to his view, it is only possible in high latitude regions where the solar radiation is highly concentrated during the short growing season. Elsewhere, the amount of radiation is not enough

or the growth of vegetable crops in spite of the larger amount of total values. Furthermore, he uncommonly high temperatures were occasionally experienced in the high latitude regions uch as Siberia, Alaska, Manchuria and northern China. This is also well explained by the igh concentration of insolation in the short summer period. Related to these subjects, the resent author has tried some studies on the meridional distribution of radiant energy. In hose studies, the amount of total radiation on any given day and also that during the selected ntervals of the growing season at the individual latitude were examined. In the present aper, those amounts of total radiation on the ring-like area between latitudes by ten degrees re analyzed. *Subject Headings:* **1. Latitude global radiation 2. Radiation distribution by atitude.**—*Author's introduction.*

12.8–310 551.521.1:551.576.2(497.2)

*Lingova, St., **Niakoi rezultati vŭrkhu izsledvane sumarnata radiatsiia v Sofiia, sofiisko i Cherni vrŭkh.** [Some results of the investigations of total radiation in Sofia, the District of Sofia and Cherni Vrŭkh peak.] *Khidrologiia i Meteorologiia*, Sofia, No. 1:29–38, **1958.** 6 figs., 9 tables, 5 refs. Russian and English summaries p. 37–38. **DLC**—The hourly and monthly sums of the total radiation according to data of Robitzsch pyranograph are analyzed. The investigation shows that the values of total radiation have an annual course reverse to that of cloudiness: maximum during the summer and minimum during the winter. The earth receives the greatest amount of solar energy in the period from 12–14 h. The solar energy reaching the peak Cherni Vrŭkh is greater than that in the experimental field and in Sofia. The values of total radiation in Sofia are lower than in the experimental field. The data are presented in tabular and graphic form. *Subject Headings:* **1. Radiation data 2. Radiation analysis 3. Sofia, Bulgaria 4. Cherni Vrŭkh Peak, Bulgaria.**—*Author's abstract.*

12.8–311 551.521.1:551.521.11

Bossolasco, Mario and Cicconi, Giuseppe, **Eliofania e radiazione globale.** [Sunshine duration and global radiation.] *Geofisica e Meteorologia*, Genoa, 6(3/4):43–45, **1958.** 4 figs., 3 refs. Italian and English summaries p. 45. **DLC**—After summarizing the defects of the Campbell-Stokes sunshine records, the authors propose the use of global radiation data to deduce the duration of insolation. This attempt is based upon the assumption that for every possible maximum of global radiation R which, with cloudless sky and pure atmosphere, is associated with a given solar elevation, there corresponds a limited value of shaded R_0 of the same global radiation, so that $R_0/R^*=k$, for any solar altitude. The hypothesis of constant proportionality with variation in solar elevation is justified by the fact that the global radiation received at the ground on a day with a sky uniformly covered with clouds remains proportioned to the corresponding maximum R, which would occur with cloudless sky and pure atmosphere. Sunshine duration data and corresponding global radiation data for Genoa were compared by constructing for each a curve similar to that of maximum radiation, $R_0=kR$ based upon different values of k and deducing the sunshine duration by adding all intervals of time in which $R>R_0$ (R=global radiation). This procedure provided for comparable results to those obtained with the sunshine recorder for June 1957–Aug. 1958, if the value $K=0.70$ was assumed. The defects of the sunshine recorder in recording duration of sunshine during sunrise and sunset is analyzed and the possibility of eliminating these with the new procedure is demonstrated. *Subject Headings:* **1. Sunshine duration 2. Global radiation data 3. Solar radiation-sunshine duration relationships.**—*I.L.D.*

12.8–312 551.501.4:551.521.12

Goĭsa, N. I., **O privdenenii rezul'tatov aktinometricheskikh nabliudeniĭ k edinomu riadu.** [Reduction of the results of actinometric observations to a single series.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Institut, Trudy*, No. 16:101–113, **1959.** 5 figs., 9 tables, 11 refs. **DWB**—The author examines the problem of the extent of the accuracy with which a 10 year series of actinometric data reflects the long period characteristics of the radiation climate. It is shown that the reduction of actinometric observation to a single series is impossible by the usual climatological methods because of the small continuity of observation series and the large distances between individual actinometric points. In order to solve the problem, the

author evaluated the methods of UKRAINTSEV, SAXINOV-ANGSTRÖM, SAVINOV, SIVKOV and KUZMIN on the basis of radiation data for Kiev for the period 1953–1958. With the aid of calculations presented in graphs and tables it is shown that the reduction of actinometric observations to a 10 year series is best accomplished either with the method of SAVINOV or SIVKOV. The formulas proposed by SAVINOV for calculating direct total radiation are $Q_0=(1-c\bar{n})$ and $\bar{n}=1-n+s/2$ respectively, where n = total cloudiness in fractions of sky cover s = relative duration of solar radiation, c = empirical coefficient equal to $1-(Q/Q_0$ for $n=1$ and $s=0$; Q_0 = possible total radiation. The equation of SIV'KOV is $Q=Q_0\left(1-k_1\frac{n_0+ne}{2}\right)$ where k_1 = coefficient characterizing penetration of total radiation through lower layer clouds. Numerical data giving the results of calculations with the various methods are presented as graphs and tables. *Subject Headings:* **1. Actinometric observations 2. Kiev, Ukrainian S.S.R.** —*I.L.D.*

12.8–313 551.521.14:551.578.46

Giddings, J. C. (*Univ. of Utah*) and LaChapelle, E. (*Univ. Wash., Seattle, Wash.*), **Diffusion theory applied to radiant energy distribution and albedo of snow.** *Journal of Geophysical Research*, Wash., D. C., 66(1):181–189, Jan. **1961.** 4 figs., 3 tables, 5 refs., 27 eqs. **DLC**—The penetration of radiation into snow is assumed to follow Fick's second law of diffusion with a term for simultaneous absorption. From this, the distribution of radiant energy in a deep homogeneous snow cover, a laminated snow cover, and a snow cover with an absorbing surface beneath is deduced. An equation for albedo is also derived. The penetration phenomenon is then analyzed in terms of the physical processes occurring and formulated as a random walk process. After a correction is made for a certain amount of nondiffuse radiation in the snow, more accurate equations for energy distribution and albedo are obtained. These results are applied to the theory of radiation measurement in snow. After experimental procedures were established on the Blue Glacier summer firn, field data were collected from winter snow at Alta, Utah, and used to check the theoretical equations for albedo and transmission to a black surface. The agreement of theory and experiment is very satisfactory. *Subject Headings:* **1. Snow albedo 2. Radiation measurement in snow 3. Blue Glacier 4. Alta, Utah.**—*Authors' abstract.*

12.8–314 551.506.7:551.507.321.2:551.521.18

Strong, John, **Balloon observations of earth radiations in the infrared, Pt. 2.** Johns Hopkins Univ. Lab. of Astrophysics and Physical Meteorology, Contract AF 19(604)-2238, Scientific Report, No. 1, Oct. 7, **1958.** 8 p. 10 figs., table. "Sequal to his Final Report, Oct. 1, 1957 on Contract AF 19(604)-949." **DWB** (M21.61 J65sci)—On Nov. 26 and Dec. 10, 1957 two balloon flights were made to measure the up minus down infrared radiation field in the upper air. A fraction of a micron spectral resolving power was achieved. Variation of this measured quantity with height (indicating divergence of flux) was determined but most of the observations were recorded at 90 K feet altitude. The analysis of the data indicates the equipment can be modified to overcome certain deficiency in calibration and measure divergence of flux precisely on its next flights. The determinations of radiation field spectrum at 90 K feet agree satisfactorily for the two flights. *Subject Headings:* **1. Infrared radiation measurement from balloons 2. Balloon infrared measurement.**—*Author's abstract.*

12.8–315 523.78 551.571.7:551.521.3:551.510.534

†Fomenko, B. D., **Izmenenie koeffitsienta prozrachnosti atmosfery vo vremia polnogo solnechnogo zatmeniia 30 iiunia 1954.** [Variation of the coefficient of transparency of the atmosphere during the total eclipse of the sun, June 30, 1954.] *Astronomicheskiĭ Zhurnal*, Moscow, 34(6):868–882, Nov./Dec. **1957.** 13 figs., 6 tables, 35 refs. Transl. into English in the corresponding issue of *Soviet Astronomy AJ*, New York. **DLC**—Measurements are reported between 2900 A and 20,000 A. An estimate is made of the effect of water vapour on the coefficient of transparency and of changes in the thickness of the ozone layer during the eclipse. *Subject Headings:* **1. Atmospheric transparency 2. Solar eclipse June 1954 3. Water vapor effects on transparency.**—*Physics Abstracts.*

12.8–316 551.501.721:551.521.3

Miurk, Kh., **O novoĭ formule intensivnosti izlucheniia i o novykh kharakteristikakh prozrachnosti atmosfer.** [New formula for radiation intensity and new characteristics of the transparency of the atmosphere.] *EEsti NSV Teaduste Akadeemia. Füüsika ja Astronoomiä Instituut, Uurimusi Atmosfäärifüüsikast*, No. 1:7–14, **1959.** fig., 2 tables, 4 refs., 17 eqs. English summary p. 14.—On the suppositions that 1) the atmosphere consists of homogeneous layers with respect to the amount of the substance causing the extinction of radiation, 2) the amount of the above-mentioned substance does not change during the time under consideration, and 3) the decrease of the coefficient of extinction is proportional to the relative increase of air-mass: dm/m the author has derived a formula (7) for the i-th layer and a formula (8) for the whole atmosphere. Taking into consideration the formulae (2) and (4) the author has obtained a formula (11) where a_1 is defined by the formula (10). Comparing the formula (11) with the formula (14) a new formula of intensity (16) has been obtained. This formula has been checked with the tables of the intensity of direct radiation of S. I. Sivkov and Sh. M. Chkhaidze; the results are given in Tables 1 and 2. Figures in the tables show difference in intensity (cal/cm² min) between the intensity determined after the formula (16) on the one hand and after the tables by Sivkov (Table 1) and by Chkhaidze (Table 2) on the other hand. The author concludes that the formula (16) is in accordance with reality and its application can be recommended. To facilitate calculations a nomogram has been constructed on the basis of the formula (16). *Subject Headings:* **1. Radiation intensity formula 2. Atmospheric transparency.**—*Author's abstract.*

12.8–317 551.551:533:551.524.3

Priestley, C. H. B. (*C.S.I.R.O., Australia*), **Temperature fluctuations in the atmospheric boundary layer.** *Journal of Fluid Mechanics*, N. Y., 7(3):375–384, **1960.** 3 figs., table, 12 refs., 9 eqs. **DLC**—A systematic analysis of published measurements of the magnitude of temperature fluctuations in the atmospheric boundary layer. These cover a wide range of height, wind speed, and thermal stratification. Within appropriate ranges of the variables, there is evidence for the existence of a dominantly forced convection regime, and also one wherein the predictions of the similarity theory of free convection are fairly closely approached. Subject to the limitations set by the recording systems used, regression relations are obtained for the magnitude of the fluctuations in terms of height and vertical temperature gradient or heat flux. *Subject Headings:* **1. Temperature fluctuation measurements 2. Atmospheric boundary layer.**—*E.Z.S.*

TEMPERATURE (551.524)

See also: **Correlation between diurnal pressure and temp. variations in the troposphere** (Matzke), 12.8–21; **Temp. lapse rates, Arctic** (Putnins, Choate), 12.8–41; **Influence of sea surface temp. on temp. of Peruvian coast** (Valle Espejo), 12.8–84; **Temp. gradients in E and F1 region, Casablanca** (Haubert), 12.8–152; **Thermal state of the earth** (Hôrai), 12.8–173; **Penetration of inversions by hot plumes** (Spurr), 12.8–279; **Permafrost and its relation to air temp., Canada, U.S.S.R.** (Brown), 12.8–324; **Temp. fluctuations and evolution of jet stream** (Ugarova), 12.8–352; **Climatic change during cold season, Fukuoka** (Kojima), 12.8–375.

12.8–318 551.524.34(477)

Solntseva, L. P., **Kolebaniia temperatury za mnogoletnii period na iuge evropeĭskoĭ chasti Soiuza.** [Long-period temperature variations in the southern part of the European U.S.S.R.] *Leningrad. Universitet, Uchenye Zapiski*, No. 269:65–84, **1959.** 7 figs., 12 refs. **DLC**—The long period temperature variations were studied by single smoothing of ten terms of a series and triple smoothing of two terms of a series. Four stations in the south of European U.S.S.R. were chosen; these were Poltava (1892–1950), Khar'kov (1896–1931), Rostov-on-Don (1881–1950) and Urinpinsk (1881–1950). These series are homogeneous. The fluctuations of the 10 yr smoothed mean annual temperatures correspond at all the stations; there is some lack of correspondence at the beginning or end of warming or cooling but it is slight and can be explained by a difference in geographic location and by the fact that some of the series contained gaps that disturbed the series. An analysis of the secular variation of temperature in different parts of European U.S.S.R. is not always uniform. An examination of

the 10 yr smoothed monthly temperature is presented with the aid of graphs. The smoothed 10 year mean January temperature alters secularly in the entire region. January temperatures are characterized by the greatest variability. Considerable temperature drop was observed between 1882 and 1885. From 1888 the temperature began to rise until 1914–1915 with a slight cooling in 1905 and a maximum in 1887. Cooling began in 1915, reaching a maximum in 1933. The cooling of 1881–1888 was the result of low monthly mean temperatures and embraced the entire U.S.S.R. The variation of April temperatures was similar in the entire area. Three periods of ten year monthly means are observed, namely, the first with a minimum in 1891, the second with a minimum in 1902 and the third with a minimum around 1902–1914. The Aprils of 1907–1920 were particularly warm. The fluctuation of the July ten year mean temperatures were similar and they had the least amplitude. They showed a warming from 1887 to 1889; then a cooling to 1910. From 1910–1935 the temperature rose. October 10 year temperatures are also similar, showing a rise from 1881 to 1887 and a fall to 1911, followed by a rise to 1929 and again by a fall to 1939 followed by a slight rise. In the case of monthly temperatures of January and February the slight fluctuations in amplitude and time have in most cases an inverse character. The summer months of June, July and August have a smooth temperature variation. The variations from the norm are slight. Marcn temperatures are close to the normal winter temperatures; April has a smoothed temperature variation; and May has considerable variation from the normal. The temperatures are marked by considerable variability as compared with the summer ones particularly those of November. The temperature differences between the north and south show a periodicity in the long period variation. Periods with slight differences exist, namely 1890–1897, 1902–1903, 1922–1937, but between these are observed periods with considerable differences (1903–1920, 1934–1941). The long period variation of temperature and precipitation indicates that in years with maximum contrasts between north and south the winter precipitation increases, years with minimum contrasts coincide with warming of the Arctic and minimum ice of northern waters. During Arctic warming the Volga has the lowest flow so that the level of the Caspian Sea falls. *Subject Headings:* **1. Long period temperature 2. Annual mean temperature data 3. Monthly mean temperature data 4. Temperature periodicities 5. Arctic warming effects 6. Ukrainian S.S.R.**—*I.L.D.*

12.8–319 551.506.3:551.582.2:551.524.36

*U. S. Weather Bureau, **Monthly normal temperatures, precipitation and degree days.** Its *Technical Paper*, No. 31, Nov. **1956.** 39 p. Almost entirely tables. **DWB** (M(055) U587t)—Normals for 1921–50 for 387 stations in the U. S., Hawaii, Alaska, Texas, the West Indies and Pacific islands are presented in tabular form arranged alphabetically by stations under each alphabetically arranged state, with extraterritorial groups following the states. *Subject Headings:* **1. Monthly climatic data 2. Degree-day normals 3. United States 4. West Indies 5. Pacific islands.**—*M.R.*

12.8–320 551.524.37(474.5)

Kaushila, K. A., **K voprosu o raspredelenii kraĭnikh dat zamorozkov na territorii Litovskoĭ SSR.** [Problem of the distribution of extreme dates of frost in Lithuania.] *Lietuvos TSR Mokslu Akademija. Geologijos ir Geografijos Institutas, Mokslinial Pranešimai*, Vol. 3, Geofizika, Hidrologija, issued Vilna, **1956.** p. 62–67. 7 figs., table, 2 eqs.—In the Lithuanian S.S.R. the distribution of mean monthly dates of frost is subject to considerable variations while the minimum monthly air temperature at a station may be almost constant, and very few secular series, the means of which are not distorted, are available. Accordingly the author constructed correlation graphs involving the mean monthly frost dates and mean minimum annual temperature during the same period for 32 points in the Lithuanian S.S.R. and adjoining regions, and maps showing the distribution of extreme frost dates and the duration of the frost free period. The mean conditions of the distribution of frost dates is thus obtained. The distribution of frost dates within individual years was determined by analyzing the maps of isochrones of frost dates for 25 years. Maps showing the isochrones of mean dates of the first spring and fall frost, and districts of different spring and fall frost risks are presented. In 50% of the springs and 60% of the falls frosts appear almost as the result of one case of cold air advection. In 40% of the spring and 30% of the fall extreme frost dates are the result of two

old air advections. *Subject Headings:* **1. Frost distribution 2. Extreme frost dates 3. Lithuania.**—*I.L.D.*

SOIL TEMPERATURE

12.8–321 551.501:551.525

Eckel, O. (*Vienna*), **Anleitung für Beobachtung der Bodentemperatur.** [A guide to soil temperature observation.] *Wetter und Leben*, Vienna, 12(3/4):82-84, **1960.** **DLC**—Instructions on the selection of a site, the set up, and reading of soil thermometers. Questions are given to serve as a guide in testing the controls. *Subject Headings:* **1. Soil temperature observation methods 2. Soil thermometers.**—*E.Z.S.*

12.8–322 551.506:551.525

Eckel, O. (*Vienna*), **Zur Kontrolle und Bearbeitung der Bodentemperaturmessungen, [I].** [Checking and analysis of soil temperature measurements, Pt. 1.] *Wetter und Leben*, Vienna, 12(3/4):63–69, **1960.** 4 figs. German and English summaries p. 63.—In order to maintain the reliability of observations or recordings of soil temperature it is necessary not only to follow general instructions when installing the thermometers but also to check the current results. For this purpose it is most suitable to plot the data in the form of tautochrones. As an example, the monthly tautochrones for one year of observations at Vienna-Hohe Warte are given. *Subject Heading:* **1. Soil temperature measurement.**—*Author's abstract.*

12.8–323 551.525.4:536.21:631.43

Broĭdo, A. G. and Suboch', N. A., **Otsenka pogreshnosti elementarnogo sposoba rascheta teplovogo balansa v grunte.** [Estimating the accuracy of a simple method of soil heat balance calculation.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 69:94–99, **1957.** 3 tables, 10 refs. **DLC**—The accuracy of various methods for computation of accumulated and lost heats in the upper layer of soil, described in 9 references, are briefly reviewed for the purpose of determinating mean relative errors. The coefficients of temperature transmission through 20 cm soil layer were calculated with complicated Tseitin's formula and with the elementary Sychev's method and with data obtained at three different field stations. Absolute difference in values and relative errors are determined and tabulated for each station. Additional determinations were made for flow of heat in soil separately during day and night with the same formulas and for the same areas. Mean values and mean errors are calculated for each case and their significances are reviewed in the text. *Subject Headings:* **1. Soil heat balance 2. Soil heat transfer 3. Soil temperature calculations.**—*N.P.S.*

12.8–324 551.525.5:551.524.2

†Brown, R. J. E. (*Nat. Res. Council, Ottawa*), **The distribution of permafrost and its relation to air temperature in Canada and the U.S.S.R.** *Arctic*, Montreal, 13(3):163–177, Sept. **1960.** 9 figs., table, 16 refs. **DLC**—Here a description of permafrost is given. This phenomenon is observed in the northern parts of Eurasia and North America. It is suspected that permafrost first appeared during the cold periods of the pleistocene. In 1928, first permafrost map in Canada was drawn up. The subject became increasingly important after the construction of the Alaskan highway during World War II. In Soviet Union, extensive work has also been done in this field. The investigations show that southern limit of permafrost coincides with 0°C mean annual isotherm. *Subject Headings:* **1. Permafrost distribution 2. Canada 3. Alaska 4. U.S.S.R.**—*A.H.K.*

12.8–325 551.506.3:551.525.4(497.1)

*Dobrilović, Borivoje N., **Godišnji hod temperature tla u Beogradu (period 1927–1940).** [Annual regime of soil temperature in Belgrade (1927–1940).] *Belgrade. Univerzitet. Meteorološki Zavod, Rasprave*, No. 1, **1957.** 26 p. 8 figs., 12 tables (3 fold.), 6 refs., 5 eqs. English summary p. 25–26. **DWB** (M(055) B429ra)—Three series of soil temperature measurements have been made in Belgrade: 1902–06, 1927–40 and 1947–date. The methods differed, so the 1927–40 material has been compiled separately, the 1902–06 data having been analyzed and published by P. Vujević in 1909. In the present series data were obtained three times daily to 30 cm with direct reading thermometers and to 75 cm to 300 cm (once daily)

by thermometers planted in boxes mean monthly and annual temperature and temperature range, temperature gradient and extremes, the components of harmonic analysis and durations of temperatures above certain values and of frost. Extreme range of soil temperatures above certain values and of frost. Extreme range of soil temperature at Belgrade was 52.2°C to −16.4°C and 60 cm the greatest depth of frost. Numerous tables and graphs accompany text. *Subject Headings:* **1. Soil temperature data, Belgrade 2. Belgrade, Yugoslavia.**—*M.R.*

12.8–326 551.525.4:631.41

Wischán, Z. (*Univ. of Szeged*), **Zusammenhänge zwischen dem Salzgehalt und dem Temperaturfaktor des Bodens.** [Correlation between salinity and temperature of the soil.] *Acta Geographica, Szeged, Hungary, n.s.*, 1(1/4):45–49, **1955.** 4 tables, 8 refs. **DLC**—A microclimatic study of the temperature characteristics of the saline soil at depths of 2, 5, 15 and 20 cm was carried out in Aug. 1954 on the saline soil near Bekes. Comparative content measurements were made on steppe soil. The *pH* total salt content, moisture content $CaCO_3$, soda, etc. of the soil at the various stations are presented in a table. Both during heating and cooling, a direct proportion was found to exist between salt content and temperature

Total salt content	Aug. 14 Temperature	Aug. 15 Maximum
0.11%	40.0%	41.4°C
0.07%	37.6%	39.2°C
0.02%	33.6%	35.0°C

An inverse proportion was found between capillary force of water ascent and temperature. This is illustrated by tables giving the capillary water ascent and temperature maxima and temperature minima respectively. *Subject Headings:* **1. Soil temperatures 2. Soil salinities 3. Soil microclimates 4. Bekes, Hungary.**—*I.L.D.*

WATER TEMPERATURE (551.526)

See also: **Influence of sea surface temp. on temp. of Peruvian coast** (Valle Espejo), 12.8–84.

12.8–327 551.526.8

*Young, Frank N. and Zimmerman, James R. (*Indian Univ., Bloomington*), **Variations in temperature in small aquatic situations.** *Ecology*, Durham, N. C., 37(3):609–611, July **1956.** 11 refs. **DWB, DLC**—The author discusses temperature variations in small aquatic situations exposed directly to the sun such as puddles, ponds and small pools, and in shaded situations and swamps; stratification, microthermoclimate and temperature reversal, and temperature variations in springs and seepages. Numerical data are presented. *Subject Headings:* **1. Small aquatic temperatures 2. Pool temperatures 3. Pond temperatures 4. Water temperature variations.**—*I.L.D.*

12.8–328 551.526:631.67

Ozawa, Y. (*Natl. Inst. of Agric. Sci., Div. of Met.*), **On the basic theory of the investigation of the water temperature distribution (Studies on the distribution of irrigation water temperature in small area, Pt. 2).** *Journal of Agricultural Meteorology*, Tokyo, 11(4):137–142, March **1956.** 2 figs., 2 tables, 3 refs., 22 eqs. In Japanese; English summary p. 142. **DWB**—The following relationship (10) was obtained as the fundamental differential equation of the change of water temperature from the physical research of the heat balance at water surface.

$$\theta(x,t)-\left\{\frac{k_1+Lk_2\alpha b}{k_1+Lk_2\alpha}\theta_a(t)+\frac{R(t)}{k_1+Lk_2\alpha}-\frac{Lk_2\beta(1-b)}{k_1+Lk_2\alpha}-\frac{\alpha_2\kappa_1 C_1\sqrt{(2\pi/7)}}{k_1+Lk_2\alpha}\sin\left(\frac{2\pi}{7}t+\epsilon_1\right)\right\}$$

$$=-\frac{Ch}{k_1+Lk_2\alpha}\left(\frac{\partial\theta}{\partial t}+v\frac{\partial\theta}{\partial x}\right) \quad (10)$$

Resolving the equation (10) by means of the Laplace-transformation, equation (18) was obtained. The comparison of the computing value from (18) with the observed value was shown in figs. The agreement was not good. But in the diurnal average value the agreement was very good. So the following equation (25), which gives the diurnal average temperature can be used to determine the distribution of the diurnal average water temperature.

$$\bar{\theta}_{(x)} = (A_0+B_0+C_0) - (A_0+B_0+C_0-E_0)e^{-x/kv} \tag{25}$$

where

$$A_0 = \frac{k_1+Lk_{2\alpha}\bar{b}}{k_1+Lk_{2\alpha}}\cdot\theta_a, \qquad B_0 = \frac{(1-s)\bar{R}'-\bar{B}}{k_1+Lk_{2\alpha}},$$

$$C_0 = -\frac{Lk_{2\beta}(1-\bar{b})}{k_1+Lk_{2\alpha}}, \qquad E_0 = \bar{\theta}_{x=0}, \qquad k = \frac{Ch}{k_1+Lk_{2\alpha}}.$$

Subject Headings: **1. Diurnal water temperature variations 2. Irrigation water temperature.** —*Author's abstract.*

12.8–329 551.526.6:551.464:627.2(261.3)

Ohl, Hans, **Temperatur-und Salzgehaltsmessungen an der Oberfläche des Kieler Hafens in den Jahren 1952 bis 1957.** [Temperature and salinity measurements of the water surfaces in Kiel Harbor, from 1952 to 1957.] *Kieler Meeresforschungen*, Kiel, 15(2):157–160, **1959.** 2 figs., 2 tables. **DWB**—Long range observations of temperature and salinity are presented. Curves for temperature and salinity for each year since 1952 and including 1957 are given. Temperature and salinity mean monthly and extreme values, and annual mean are given for each year. *Subject Headings:* **1. Salinity data 2. Temperature of water surfaces 3. Kiel Harbor, Germany.**—*E.Z.S.*

12.8–330 551.526.6(265) 551.515.8:551.556.8:551.465

Fukuoka, Jiro, (*Oceanographic Section, Met. Agency, Tokyo, Japan*), **Variation of the oceanic conditions in the north western Pacific.** (In: UNESCO Symposium on Physical Oceanography, Tokyo, Oct. 1955, **Proceedings,** pub. **1957.** p. 76–86. 14 figs., 2 tables, 6 refs. French summary p. 76.) **DWB**—After considering short period changes of water temperature, and changes in an interval of months, long periodic changes of oceanic conditions are reviewed. The author discusses the relation between wind and polar fronts in the ocean. When curl = 0 the wind stress has the maximum west component. Variations of oceanic conditions are related to the wind. *Subject Headings:* **1. Oceanic conditions-wind relationships 2. Northwestern Pacific Ocean.**—*E.Z.S.*

12.8–331 551.526.6:551.465(265)

Chu, T. Y., **Water temperature distribution and ocean currents of the neighbouring seas along China coasts.** *Meteorological Bulletin*, Taipei, Formosa, 1(4):11–15, Dec. **1955.** 8 figs., 3 tables, 4 refs. In Chinese. **DLC** (Orientalia)—Water temperature along the Sea coast increases variation between North and South in winter. This is due to the infiltration of continental air mass from polar region. The appearance of sea fog effected by the variation of water temperature has been observed in the continental variability. In order to investigate its characteristics, it was classified into warm-sea, cold-sea and continental itself (Table 1) and compared with monthly mean values of air temperature, of water and of range in Ching-tao Is. (Table 2). Discussing the major factor of Kuroshio current, the maximum range of water temperature in N. Pacific and coastal seas was tabulated for the months of Jan. and Aug. Seasonal variation of ocean currents in the coast of Taiwan is shown in 6 figs., from which the conclusion is drawn that the variation of water temperature in China is due to the effect of Kuroshio at N. equator current and coastal current in the neighboring seas. *Subject Headings:* **1. Ocean currents 2. Kuroshio current effects 3. Water temperature distribution.** —*K.C.*

12.8–332 551.526.6(262.8)

*Arkhipova, E. G.; Liubanskiĭ, V. A. et al., **Osnovnye osobennosti temperaturnogo rezhima Kaspiĭskogo moria i ego raĭonov.** [Basic characteristics of the temperature regime of the

Caspian Sea and its different regions.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 43:53–100, **1958.** 11 figs., 21 tables, 15 refs. **DLC**—The oceanographic and meteorological data for Neftianye Kamni, other places on the Caspian Sea and long period records for 34 stations and 58 squares of latitude and longitude have been analyzed to give a thorough perspective of the temperature regime of the coastal waters and the water in the open Caspian Sea with special attention paid to the seasonal and diurnal variation and the long period variations (1904–1954) in temperature, and variations with wind and weather and possible variations with the lowering of the water level of the Sea. Tables give mean month to month changes in water temperature, between the temperature of east and west coast stations in the same latitude, extreme monthly anomalies at different stations, maximum temperature each month, diurnal change at various stations each month (7–13h), and pecularities of various localities, thermal relations to ice regime and evaporation now and in the future. *Subject Headings:* **1. Water temperature regime-Caspian Sea. I. Reznikova, L. P.**—*M.R.*

PRESSURE AND WIND

PRESSURE (551.54)

See also: **Correlation between diurnal pressure and temp. variations in the troposphere** (Matzke), 12.8–21; **Solution of equation for forecasting atmospheric pressure field** (Nemchinov), 12.8–263; **Diurnal variation of geopotential heights of isobaric surfaces** (Khandozhko), 12.8–270.

12.8–333 551.491.54:551.543

Peck, A. J. (*C.S.I.R.O., Australia*), **The water table as affected by atmospheric pressure.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2383–2388, Aug. **1960.** 5 figs., 5 refs., 10 eqs. **DLC**—In the common situation where air is entrapped in the water, the water table height will vary with atmospheric pressure. The magnitude of this effect must be known before water-table changes can be related with any precision to other factors such as evapotranspiration, infiltration, and drainage. A theory of this effect is developed and the influences of hysteresis and solubility are discussed. It is shown that the maximum rate of change of water-table height with air pressure occurs when the water table is at the surface of the soil. The experiments clearly show the influence of hysteresis, and the results agree excellently with the theoretical predictions. *Subject Headings:* **1. Water table variations 2. Pressure effects on water level.**—*Author's abstract.*

TURBULENCE (551.551)

See also: **Turbulent currents causing airplane bumpiness, Sukhumi-Tiflis-Erevan route** (Lominadze, Napetvaridze), 12.9–69; **Use of Richardson number in detecting aircraft bumpiness zones** (Zavarina, Iudin), 12.8–70; **Use of power spectra and scales of turbulence in estimating wind loads** (Cramer), 12.8–103; **Tangential wind stress above a turbulent sea surface** (Vinogradova), 12.8–194; **Graphical method for determining vertical velocity** (Wiin-Nielsen), 12.8–222; **Determination of turbulent heat flow** (Perepelkina), 12.8–251; **Progress in forecasting high level clear air turbulence** (Harrison), 12.8–268; **Formations of turbulent motion at fronts** (Gandin), 12.8–298; **Showalter index and associated weather** (Wilkie), 12.8–300; **Temperature fluctuations in atmospheric boundary layer** (Priestley), 12.8–317.

12.8–334 551.511.6:551.551.2

Deland, Raymond J. and Panofsky, Hans A., **Structure of turbulence at O'Neill, Nebraska, and its relation to the structure at Brookhaven.** Pennsylvania. State Univ. Mineral Industries Experiment Station. Dept. of Meteorology, Contrast AF 19(604)-1027, Scientific Report, No. 2, Jan. 1, **1957.** 44 p. 43 figs., table, 7 refs., eqs. **DWB**—This investigation analyzes fast-response measurements of the turbulent fluctuations of wind velocity obtained at O'Neill, Neb. during the Great Plains Turbulence Field Program, 1957, and attempts to relate the properties of such turbulence to mean meteorological parameters. Material includes

the properties of the spectra and cross-spectra and of total variances and covariances at O'Neill, a comparison of O'Neill and Brookhaven, the estimation of turbulence characteristics from mean parameters, and the eddy energy equation. (For Final Report for 1957, *see* 11.2–218, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Turbulence structure 2. Turbulence comparisons 3. O'Neill, Nebr. 4. Brookhaven National Lab., N. Y.**—*N.N.*

12.8–335 551.508.94:551.551:551.594.13

Faucher, G. A. (*A. F. Cambridge Research Center*), **A study of air flow in a large-ion chamber.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):288–292, **1958.** 4 figs. (incl. photos), 4 refs. **DLC**—Turbulence in a large-ion chamber has an influence on the measured ion mobility distribution. A technique was developed to investigate the flow in a large-ion chamber with titanium tetrachloride smoke. Many sources creating turbulence in the chamber were revealed. The entire set-up consisted of Pyrex glass, and the complete flow of smoke was recorded on cine film. These smoke experiments made it possible to redesign the chamber with laminar flow at air velocities up to 3 l./sec. *Subject Headings:* **1. Turbulence experiments 2. Ion chambers 3. Ion mobility.**—*Author's abstract.*

12.8–336 551.551.5:551.511.6:551.509.52

*†Clodman, Joseph; Morgan, Griffith M., Jr. and Ball, John T., **High level turbulence.** New York Univ. College of Engineering. Research Division. Dept. of Meteorology and Oceanography, Contract AF 19(604)-5208, Final Report, Sept. **1960.** 84 p. 18 figs., 11 tables, 66 refs., 33 eqs. **DWB**—A comprehensive review of the literature of high level turbulence is carried out and conclusions are drawn as to many of the properties of this phenomenon. The effect of moderate topography is examined by considering two bodies of air craft reports. It is reasonably well established that even modest obstacles of less than 1000–2000 ft in height play an important role in high level turbulence over land and that some of the parameters involved suggest a relationship to gravity waves although this is only part of the mechanism. High level turbulence reports over the North Atlantic are examined and it is found that such turbulence is much less common and occurs under different conditions than over land. The basic equations governing the energetics of the motion are examined and conclusions drawn as to the important energy sources and sinks. A model is used to estimate the rate of growth due to various energy sources to determine plausible mechanisms. Two mechanisms are evolved which appear to be of predominant importance in the development of high level turbulence. One of these is significant over land and involves primarily gravity waves and strong vertical wind shear. The other is important over water and results from hydrodynamic instability and relatively low Richardson numbers. The observational data on the turbulence is considered in the light of these mechanisms and found to fit very well. A forecast scheme for high level turbulence is suggested on the basis of the above results. *Subject Headings:* **1. High level turbulence forecasting 2. Upper air turbulence.**—*Authors' abstract.*

12.8–337 551.551.5:551.574.7

Crossley, A. F. (*Met. Office, London*), **Ice accretion and turbulence on North Atlantic air routes.** *Royal Meteorological Society, Quarterly Journal*, 87(371):55–64, Jan. **1961.** 3 figs., 9 tables, 6 refs. **DWB, DLC**—Routine observations made in transport aircraft in Jan. and July, 1955–57, are analyzed to obtain the frequency of ice accretion in relation to air temperature and of turbulence in relation to wind speed and cloud. Comparative freedom from icing in the range 0° to −3°C is attributed to the effects of kinetic heating. In Jan. the frequency attains a maximum of 43% of occasions in cloud at −4° to −7°C; in July 20% at −4° to −11°C. There is a secondary maximum in both months near the lowest temperatures at which icing is reported, which is attributed to flight through the upper parts of convection cloud. The frequency of icing in July is generally much less than at the same temperatures in Jan. Turbulence is reported on about 5% of all occasions in Jan. and on 2% in July; in cloud the frequencies are 18 and 12% respectively. The frequency of turbulence tends to increase with the wind speed. *Subject Headings:* **1. Aircraft icing 2. Atmospheric turbulence 3. North Atlantic air routes.**—*Author's abstract.*

WIND—WIND VARIATIONS

See also: **Calculation of water circulation in Baltic Sea for two types of wind fields** (Soskin, Denisov), 12.8–196; **Wind variability** (Ellsaesser), 12.8–275.

12.8–338 551.552/3:551.43(529)

Chi, C. H., **Surface air currents in Sin-Kiang.** *Meteorological Bulletin*, Taipei, Formosa, 1(3):33–38, Sept. **1955.** fig., 6 tables. In Chinese. **DLC** (Orientalia)—The characteristics of orography, basins, and geographical divisions between south and north, are described and the cause of severe cold and hot weather due to the passage of cold front with high air pressure through the northern division (Fig. 1) is discussed. As shown in Tables 1–5, frequency of wind direction in 15 areas in each season was tabulated for 1941–1944. Table 6 shows a yearly frequency of wind direction and indicates that throughout the year, NE-wind occupied the highest position by $\frac{1}{5}$ out of total frequency; E-wind by 15/100; N- and SE wind by 10/100, but in the basin the above rate was not necessarily the same. *Subject Headings:* **1. Orographic effects on winds 2. Sinkiang, China.**—*K.C.*

WIND PROFILES

See also: **Measuring wind and temp. profiles over water** (Portman), 12.8–220; **Graphical method for determining vertical velocity** (Wiin-Nielsen), 12.8–222.

12.8–339 551.553:551.556.1:632.117

Härtel, Otto (*Pflanzen Univ., Graz*), **Zur Auswertung von Windrichtungsregistrierungen bei Rauchschadenuntersuchungen.** [Evaluation of wind direction records in investigation of smoke damage.] *Wetter und Leben*, Vienna, 12(1/2):1–5, **1960.** 2 tables, 11 refs. German and English summaries p. 1. **DLC**—A review of studies of the opening and closing of leaf stomata shows that during bad weather they are open while during fair weather they are closed. The release of water vapor and absorption of CO_2 occur during the opening of the stomata and the penetration of noxious gases occurs under similar conditions. The relationship of damage caused by atmospheric SO_2 in pine stands and the stomatal openings was investigated by considering the relationship of plant damage to wind direction frequencies, which in turn were analyzed without reference to weather and with reference to fair and bad weather. The resulting wind rose is termed the "physiological wind distribution." Wind direction takes into account the direction towards which the winds blow. Data showing the relationship of physiologically active winds to plant damage by SO_2 are presented. There is shown a close relationship between plant damage and intensity of emission where physiologically active winds are used so that the role of weather in opening and closing of the stomata is considered than when ordinary wind roses are employed. *Subject Headings:* **1. Plant damage by SO_2 2. Wind effects on plants 3. Weather effects on plants.**—*I.L.D.*

12.8–340 551.553.1/3(474.5)

Ol'shauskas, S. K., **O vetrovom rezhime nad territoriei Litovaskoi SSR po dannym samopistsev vetra.** [Wind regime over the territory of the Lithuanian S.S.R. according to automatic wind recorder data.] *Lietuvos TSR Mokslu Akademija. Geologijos ir Geografijos Institutas, Mokslinial Pranesimai, Vol. 3, Geofizika, Hidrologija*, issued Vilna, **1956.** p. 9–10. table.—Data on the mean monthly and mean hourly wind velocity in met/sec for Klaipeda (1928–1939) and for Kaunas (1924–1940) are presented and the wind velocity regime as represented by those data is discussed. At Klaipeda the frequency of different wind velocities varies slightly from hour to hour; the mean annual amplitude is 2.0 met/sec and the minimum monthly mean is 4.2 met/sec in May and 6.2 met/sec in Dec.; the mean annual velocity is 5.2 met/sec, etc. At Kaunas the mean annual amplitude is 1.6 met/sec and the minimum velocity is 2.2 met/sec in Aug. and the maximum is 3.8 met/sec in Jan.; the mean annual velocity is 3.1 met/sec, etc. *Subject Headings:* **1. Wind regime 2. Klaipeda, Lithuanian S.S.R. 3. Kaunas, Lithuanian S.S.R.**—*I.L.D.*

12.8–341 551.553.11:551.515.8:629.135.15

§Wallington, C. E. (*Met. Office, Dunstable*), **The structure of the sea breeze front as revealed by gliding flights.** *Weather*, London, 14(9):263–270, Sept. **1959.** 6 figs., 4 refs. **DLC**

—A report describing the structures of two sea breeze fronts as observed by gliding flights at Lashan Gliding Center, Hampshire. The two fronts are the sea breeze front of 6 July 1956 and the sea breeze front of 21 May 1958. The observations of sea breeze effects are reported and the noteworthy features arising from these observations are pointed out. Sample synoptic charts and isochrones of the two sea breeze fronts as well as their autographic records are graphically represented. *Subject Headings:* **1. Sea breeze fronts 2. Synoptic charts 3. Lashan Gliding Center, Hampshire, Eng.**—*I.S.*

12.8–342 551.553.12

Buettner, Konrad J. K. (*Univ. of Washington*) and Elliott, William P. (*U. S. Air Force Cambridge Res. Center, Bedford*), **Researching winds in Mount Rainier.** *National Parks Magazine*, Wash., D. C., 33(147):6–7, Dec. **1959.** photo, map.—The Geophysics Research Directorate of the Air Force Cambridge Research Center is sponsoring a research program conducted by scientists from the Department of Meteorology and Climatology of the University of Washington. It is part of a broad program investigating the effects of terrain on wind flow. The purpose is to learn the characteristics of about a dozen types of wind systems in valleys. Studies made in 1957 and 1958 in and around Carbon River Valley, northwest area of Mount Rainier, are described. The Air Force is interested because ability to forecast wind velocities near the ground is essential. Solutions of some problems of the biologists, city planners and conservationists involve understanding of the wind regimes. *Subject Headings:* **1. Wind systems in valleys 2. Orographic effects 3. Terrain effects in valleys 4. Wind velocity forecasts.**—*E.Z.S.*

SPECIAL WINDS (551.555)

12.8–343 551.555.3

Kasamura, Y., **On the local föhn observed at Ooita.** *Journal of Meteorological Research*, Tokyo, 7(10):683–685, Dec. **1955.** 12 fig., 3 refs. In Japanese. **DWB, DLC** (M55.3(522.6)—Föhn phenomena appeared from the early morning until midnight and with a pressure distribution of low to the E and high to the W in winter at Ooita. Its observed characteristics are as follows: (A) föhn occurs even in the cloudy sky; (B) wind velocity is of 3–4 m before the appearance and wind direction tends to be southerly; (C) vapor tension is generally low and not related to air pressure. However, air temperature increases, while humidity decreases with a sudden wind. *Subject Headings:* **1. Föhn observations 2. Ooita, Japan.**—*K.C.*

12.8–344 551.509.31:551.555.3(234.3)

Steinhäusser, Hans (*Hydrograph. Landesabteilung Klagenfurt*), **Orographische und dynamische Einflusse bei Föhn- und Staulagen in den Südalpen: zur Frage des Föhns im Klagenfurter Becken.** [Orographic and dynamic influences during föhn and upslope situations in the Southern Alps: the problems of föhn in the Klagenfurt Basin.] *Meteorologische Rundschau*, Berlin, 12(2):54–58, March/April **1959.** 4 figs., 9 refs. **DWB, DLC**—In the Klagenfurt Basin in the southern Alps, blocking and föhn situations show that sometimes orographic influences recede in importance to weather processes. In order to determine the geographic condition of mass blocking and föhn regions, the author examined the various mountain ridges in the eastern Alps that may act as weather sheds. The orographic conditions of the southern east Alps offered few favorable conditions for the development of a south or north föhn over the Klagenfurt basin. The intense dissection of the eastern Alps hinders the formation of a distinct föhn flow, and if one such arises then the width of the basin facilitates föhn break up of the cloudiness and the diminution of precipitation. When southerly föhn prevails in the Klagenfurt Basin then the air masses have streamed across the Karawanken Alps. Also the development of the north föhn over the Klagenfurt Basin is hindered in many instances by the orography. The air masses cross during the west-northwest, flow at first over the main Alpine ridge of the High Taurus, during the northwest to north winds they cross the Low Taurus, then the northern branch of the principal range in addition the southern range of the Gurktal Alps whereby the föhn phenomena are not intensified. The air masses descending accompanied by föhn phenomena to the Klagenfurt Basin occasionally experience weak block-

ing on windward slopes. Neither the south nor the north föhn is regarded as unpleasant by the inhabitants of the Klagenfurt Basin. A detailed description with the aid of synoptic maps and weather data is given of a typical northern föhn situation on the Klagenfurt Basin which occurred during Nov. 29–Dec. 1, 1957. It showed the following typical north föhn characteristics; during the outbreak of the north föhn the cold air layers situated over the Klagenfurt Basin were replaced by polar cold air and in spite of intense dissection of the east Alps north föhn phenomena can be very pronounced over the Klagenfurt Basin. The temperature can rise more than 10°C within a few minutes and the relative humidity can fall from almost 100% to less than 25%. Just as in the case of cold air incursions in the Klagenfurt Basin dynamic processes determine the effectiveness of the cold front so as the formation of föhn, and orography is by itself not of primary importance; its effects are overlain by dynamic processes which are related either to large scale or frontal phenomena. Thus, if precipitation occurs on the south side of the Alps, especially on the Karawanken then the southeast to southwest flow aloft descends föhn like into the Klagenfurt Basin as the blocking is so intense that the precipitation that has spread in the lee of the Karawanken occurs without noticeable dissolution of the cloudiness or improvement of visibility. In the case of pure upglide weather situation—chiefly Vb situations—the cold air masses extend beyond the ridges and both blocking and föhn effects recede. *Subject Headings:* **1. Föhn analyses 2. Föhn development 3. Upslope phenomena 4. Klagenfurt Basin, Alps.**—*I.L.D.*

12.8–345 551.555.3:551.586:616:312.26

Undt, W. (*Vienna, Hohe Warte* 38), **Tage mit freiem Föhn und ihre biologische Bedeutung.** [Days with free föhn and their biological significance.] *Zeitschrift für Meteorologie*, Berlin, 12(4/6):135–138, April/June **1958.** 5 refs. **DWB, DLC**—This study is concerned with determining whether anticyclonic weather situations have the same biological effect or whether differences exist between the effect of anticyclonic weather with subsidence processes (free föhn) and that without subsidence. The anticyclonic weather situations recorded in Vienna during 1954–1957 were classified into groups characterized by subsidence and non-subsidence weather and mortality statistics associated with these situations were analyzed statistically by the chi-square test. The statistical analysis of the data shows that a lower mortality on days with predominant anticyclonic weather but this is not statistically significant. A comparison between days with free föhn without inversions and days with large temperature gradients and low lying inversions showed that the latter were characterized by a mortality greater than the actual monthly mean mortality. This indicates that inversions exert or decrease biotropic effect. Days with transitional weather situations (trough aloft) show this effect more markedly. *Subject Headings:* **1. Biological effects of föhn 2. Free föhn 3. Anticyclonic weather 4. Mortality due to weather 5. Inversions 6. Vienna, Austria.**—*I.L.D.*

12.8–346 551.555.6

Listrovoi, A. A., **Ursat'evskie vetry.** [Ursat'ev winds.] *Sredneaziatskiĭ Nauchno-Issledovatelskiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 2(17):54–84, **1959.** 14 figs., 14 tables, 3 refs. **DWB** (M(055) U581ts)—With the aid of numerical data presented in tables and synoptic maps, the author presents a comprehensive account of the available knowledge on the nature and development of Ursat'ev winds. The contents of this paper include the following: physical geographic description of the region of passage of winds from the Fergana Valley, climatic description of the wind regime at Ursat'evska including mean seasonal wind velocities, mean relative frequencies of wind directions, number of days with intense winds etc. aerological characteristics over Ursat'evska, synoptic conditions of intense Ursat'ev winds including the types of synoptic processes, the southwest periphery of the anticyclone, cyclonic invasions from the south of the Caspian Sea, cyclonic invasions from the basin of the Murgab and Tedzhen Rivers, western cold invasions and northwestern cold invasions, pressure gradients during intense Ursat'ev winds, stagnation of cold air in the Fergana Valley, pressure variations in valleys widely open to the west of mountain valleys including synoptic signs of the beginning, intensification, weakening and interruption of Ursat'ev winds. *Subject Headings:* **1. Ursat'ev winds 2. Wind regimes 3. Synoptic conditions 4. Fergana Valley, Turkestan S.S.R.** —*I.L.D.*

WIND EFECTS (551.556)

See also: **Wind-drifted snow, Charcot Station** (Garcia), 12.8–47; **Drift of toxic chemicals** (Yeo et al.), 12.8–73; **Wind load on towers** (Cohen), 12.8–102; **Use of power spectra and scales of turbulence in estimating wind loads** (Cramer), 12.8–103; **Met. study of generation of elec. by wind power,** 12.8–106; **Wind effects on sea currents, Black and Azov Seas** (Belinskiĭ, Glagoleva), 12.8–190; **Currents around Liban lightship** (Morozov), 12.8–191; **Wind wave activity in a deep sea** (Gershengorn), 12.8–192; **Influence of boundary surface on wind currents** (Lineĭkin), 12.8–193; **Tangential wind stress above a turbulent sea surface** (Vinogradova), 12.8–194; **Wind waves at an island in the open sea** (Ovsiannikov), 12.8–195; **Water exchange between Baltic and North Seas** (Soskin), 12.8–197; **Variation of oceanic conditions, N.W. Pacific** (Fukuoka), 12.8–330; **Evaluation of wind direction records** (Härtel), 12.8–339.

12.8–347 551.556.4:551.578.46(99)

Vickers, William W. (*Arctic Inst. of North America*), **Wind transport of Antarctic snow.** *American Geophysical Union, Transactions*, 40(2):162–167, June 1959. 2 figs., table. **DWB, DLC**—This report is based on a paper presented at the IGY Symposium during the 125th meeting of the American Association for the Advancement of Science, Washington, D. C., Dec. 29–30, 1958. Wind profile studies were made on the Victoria Plateau to determine whether the methods of R. A. Bagnold, who correlated wind speed and the quantity of sand carried by wind, can be adapted to studies of wind transport of snow. Some results of these studies and of observations of the formation and movement of sastrugi are described. A diagram of snow barchans shows the relationship between the wind profile and the depositional process. An example of sastrugi surface near IGY Little America Station is shown. Qualitative investigation shows the phenomenon of blowing snow in Antarctica to be remarkably similar to that of blowing sand. Apparently there is considerable disparity between two possible methods, wind profile versus snow catcher, by which one might arrive at working figures for snow transport. *Subject Headings:* **1. Wind transport of sand 2. Wind transport of snow 3. Snow transport by wind 4. Victoria Plateau, Antarctica.**—*E.Z.S.*

UPPER AIR WINDS (551.557)

See also: **Turbulent currents causing airplane bumpiness, Sukhumi-Tiflis-Erevan route** (Lominadze, Napetvaridze), 12.8–69; **Upper wind distribution** (Crutcher), 12.8–237; **Climatological analysis of routine transosonde flights** (Angell), 12.8–241; **Experiment in numerical prediction of 500 mb wind field** (Pedersen), 12.8–264; **Some problems of jet streams** (Mohácsi), 12.8–287; **Mean 200-millibar winds at Aden, Jan. 1958** (Murray), 12.8–288; **Formations of turbulent motions at fronts** (Gandin), 12.8–298; **Characteristics of air currents above the Pamirs and western Tian-Shan, U.S.S.R.** (Morozova et al.), 12.8–391.

12.8–348 551.506.7:551.557(267)

Hogarth, D. F.; Radok, U. and Schultz, K. G., **Some upper wind observations for the tropical Indian Ocean.** *Meteorological Magazine*, London, 88(1,042):97–104, April 1959. 5 figs., 12 refs. **DWB, DLC**—Upper winds from different parts of the tropical Indian Ocean were studied during Feb. and April 1956. Some of them were observed at altitudes exceeding 80,000 ft. Results of the observations reveal that the conditions are similar to those of the central Pacific. *Subject Headings:* **1. Upper wind data 2. Indian Ocean.**—*N.N.*

12.8–349 551.506.7:551.557(94)

*Lamond, M. (*Bur. of Met., Melbourne*), **Tabulated upper wind data for Australia.** *Australia. Bureau of Meteorology, Project Report*, No. 55/688, April 1959. 18 p. 13 tables, 3 refs. **DWB** (M(055) A938pr)—The monthly vector mean wind and standard vector deviation is presented for 21 stations in the Australian region for heights from 5000 to 60,000 ft. Limiting factors, accuracy, methods of analysis and smoothing are described and a table presented to show coordinates, length of record, method of observation, etc. Actual values are tabulated for 5, 10, 20, 30, 40, 50, 55 and 60 thousand ft for each month. *Subject Headings:* **1. Vector mean upper air winds 2. Australia.**—*M.R.*

12.8–350 551.510.53:551.511.3:551.557.33

Sawyer, J. S. (*Met. Office, Dunstable*), **Quasi-periodic wind variations with height in the lower stratosphere.** *Royal Meteorological Society, Quarterly Journal*, 87(371):24–33, Jan. 1961. 8 refs., 13 eqs. **DWB, DLC**—Quasi-periodic wind variations with height have been commonly observed in the lower stratosphere by means of the radar-sonde theodolite at Crawley. The atmospheric disturbances which give rise to these wind variations have a vertical dimension of 1 km or so, but their horizontal dimensions must be much greater, perhaps of the order of several hundred kilometers. Perturbation theory is used to show that slow "inertia oscillations" with a period of the order of half a day might have such dimensions. *Subject Headings:* **1. Perturbation theory 2. Inertia oscillations 3. Wind variation with height 4. Stratospheric winds.**—*Author's abstract.*

12.8–351 551.513.2:551.557.5:551.43

§†Bugaev, V. A., **Obrazovanie struĭnogo techeniia v atmosfere pod vliianiem gornykh massivov Sredneĭ i Tsentral'noĭ Azii.** [Formation of the jet stream in the atmosphere under the influence of the mountain massifs of middle and central Asia.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:3–11, **1958.** 4 figs., 4 tables, 13 refs. **DWB, DLC**—The northern branch, resulting from the division of the latitudinal zonal flow by the central and middle Asian mountain massifs, interacts with subtropical air south of the massif in the winter to form planetary frontal zone aloft, which produces unstable weather. The quasizonal frontal zone flow bends around the Himalayas from the south so that strong winds aloft are formed. The northern branch interacts in summer with tropical air which moves northward and strong zonal flow is formed along the northern boundaries of the central Arctic massif. The interaction between the planetary circulation and the orographic systems produce jet streams. This atmospheric situation is investigated for the summer seasons, when strong air currents appear over the Tien Shan, with the aid of a detailed analysis of a single example, during July–Aug. 1956. Synoptic charts, isallotherms, a vertical temperature section data on temperature gradients between air sounding points, relative number of circulation solenoids in a plane vertical section, etc. are presented. *Subject Headings:* **1. Jet stream formation 2. Planetary circulation 3. Orographic effects on jet stream formation.**—*I.L.D.*

12.8–352 551.524.73:551.557.5

†Ugarova, K. F., **Rol' izmenenii temperaturnogo polia troposfery v evoliutsii struĭnykh techeniĭ.** [The role of temperature fluctuations in the troposphere in the evolution of jet streams.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:22–27, **1958.** 3 figs., table. **DWB, DLC**—Eleven cases of jet streams over the European U.S.S.R. during the winter seasons (Oct–April) 1954–1956, all characterized by velocities exceeding 100 km/hr and situated at the 300 mb level were analyzed in order to determine the relationship between temperature variations in the troposphere and the origin of jet streams. All cases showed that the daily local variations of the geopotential gradient (in decameters/1000 k) on the isobaric 300 mb surface in the region of intersection of the jet stream with this surface are accompanied by local and close variations of temperature contrasts of the 300–850 mb layer at those points. In addition to the advective temperature changes in the troposphere vertical temperature changes play an essential role in the formation of jet streams. The vertical movement does not form a uniform circulation cell over the entire extent of the jet stream, instead it alters across the jet stream as a function of change in circulation processes. Two examples showing the distribution of daily advective and adiabatic variations of temperature in a jet stream zone are analyzed. *Subject Headings:* **1. Tropospheric temperature-jet stream relationships 2. Jet stream formation 3. European U.S.S.R.**—*I.L.D.*

VERTICAL MOTION (551.558)

See also: **Vertical movement in F region, Casablanca** (Haubert), 12.8–151.

12.8–353 551.558.21:533.6.07

Serra, L., **Variations of the wind with local relief: results of wind tunnel tests.** (In: National Research Council of Canada (comp.), **Technical papers presented to the Wind Power Working Party (of the O.E.E.C.).** London, H.M. Stationery Office, **1954?** p. 103–111.

8 figs.) **DWB**—Wind tunnel tests using four types of models were conducted in 1949 to study air flow in various topographic situations. Miscellaneous remarks are made on the graphs of equal-speed curves. Results give qualitative information but there is still the question of how to relate results from wind tunnel to practice. *Subject Headings:* **1. Wind tunnel tests 2. Orographic effects on wind.**—*E.Z.S.*

12.8–354 532.5:551.558.21

Yih, Chia-shun (*Dept. of Engineering Mechanics, Univ. of Michigan*), **Exact solutions for steady two-dimensional flow of a stratified fluid.** *Journal of Fluid Mechanics*, London, 9(2):161–174, Oct. 1960. 3 figs., 54 eqs., 4 refs. **DWB, DLC**—Three classes of exact solutions for steady two-dimensional flows of a stratified fluid are found. The flows which correspond to these solutions have arbitrary amplitude (however-defined). Two of the three classes of solutions have close bearings on the lee-wave problem in meteorology. It is also shown that the amplitudes of the lee-wave components (if there is more than one component) depend not on the details of the shape of the barrier, but only on certain simple integral properties of the function for the singularity distribution generating the barrier. *Subject Headings:* **1. Hydrodynamics 2. Lee waves.**—*Author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROLOGY

HYDROLOGY

HUMIDITY

See also: **Variation of coefficient of transparency of atmosphere during total eclipse of sun, June 30, 1954** (Fomenko), 12.8–315.

12.8–355 551.506.3:551.571(73)

Reitan, Clayton H. (*Univ. of Arizona*), **Mean monthly values of precipitable water over the United States, 1946–56.** *Monthly Weather Review*, Wash., D. C., 88(1):25–35, Jan. 1960. fig., 2 tables, 4 refs. **DWB, DLC**—Mean monthly values of precipitable water have been computed for radiosonde stations in the United States for 1946–56. The individual monthly values and an elementary statistical analysis are presented for 52 stations with data during all or part of the period. *Subject Headings:* **1. Precipitable water calculations 2. United States.**—*Author's abstract.*

EVAPORATION-EVAPOTRANSPIRATION (551.573)

See: **Calculation of the need of water supply for grassland, Netherlands** (van Duin), 12.8–198; **Determination of evaporation by means of the water balance** (Visser, Bloeman), 12.8–199; **New uses for evaporative cooling** (Ash), 12.8–384.

CONDENSATION (551.574)

See also: **Use of data in calculating glaze loads** (Rudneva), 12.8–105; **Ice accretion and turbulence, N. Atlantic air routes** (Crossley), 12.8–337.

12.8–356 551.574.11:551.508.91

Levin, L. M., **O zabore prob aerozolia.** [Collection of aerosol samples.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich.*, No. 7:914–925, July 1957. 4 figs., 3 tables, 9 refs., 37 eqs. **DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, U.S.S.R., Geophysics Series.* **DLC**—The author analyzes the variations in the concentration of aerosol particles when they are sucked into a small tube. The equation of motion of small particles of a monodisperse aerosol when it is drawn into a small tube is solved by the method of small parameter. The concentration of particles in the aerosol that has been sucked is determined as a function of the dimensions and density of the particles, wind

velocity and the volume of the sucking apparatus. *Subject Heading:* **1. Aerosol sampling and analysis.**—*I.L.D.*

12.8–357 551.509.318:551.574.42

Raevskiĭ, A. N. and Kaushanskiĭ, E. L., **Vozniknovenie pozdnego gololeda.** [Occurrence of a late glaze storm.] *Meteorologiia i Gidrologiia*, Moscow, No. 10:22–24, Oct. **1959.** fig. **DWB, DLC**—The occurrence of ice crusted ground on the Odessa railroad on April 17, 1957, is described in detail with chart. The process of cyclogenesis over the Black Sea and southern portion of U.S.S.R. with rapid temperature changes is outlined with regard to northern air movements and sudden ice formation on the ground after falling of overcooled rain drops. *Subject Headings:* **1. Glaze storms 2. Odessa Region, U.S.S.R.**—*N.P.S.*

12.8–358 551.574.42(761)

Williams, Baker B. (*U. S. W. B., Huntsville, Ala.*), **The 1960 ice storm in northern Alabama.** *Weatherwise*, Boston, 13(5):196–199; 203, Oct. **1960.** 4 figs., 4 charts. **DWB**—An unusual ice storm hit northeastern Alabama on 2 March 1960. The ice storm occurred in a major storm system with abundant precipitation and air temperatures just above freezing. The charts show the development of the storm from 1st March onwards; by noon of 2nd March a major storm had developed in the northwest Gulf of Mexico. At the Huntsville airport the temperature ranged from 33°F to 38°F. The State of Alabama suffered a damage of 20 million dollars from this storm. *Subject Headings:* **1. Ice storms 2. Alabama.**—*A.H.K.*

FOG (551.575)

See: **Use of mathematical statistics for study of microstructure of fogs and clouds** (D'iachenko), 12.8–223; **Forecasting advection-radiation fog, Malton Airport** (Legg, Richards), 12.8–272.

CLOUDS (551.576)

See also: **Clouds from Howard to the latest international atlas** (Affronti), 12.8–58; **Vertical distribution of clouds in frontal zones over West Siberia** (Sovetova), 12.8–299; **Global radiation at Mogadiscio** (Berg), 12.8–304; **Results of investigations of total radiation in Sofia, District of Sofia and Cherni Vrŭkh peak** (Lingova), 12.8–310.

12.8–359 551.507.352:551.506.7:551.576(213)

*Wexler, Ruth and Malkus, Joanne, **Tropical meteorology: observational studies of tropical clouds: results of 1956 Caribbean aircraft expedition.** Woods Hole Oceanographic Institution, Contracts Nonr 1721(00) and Cwb 9241, Technical Report No. 3, Sept. **1958.** 122 p. 76 figs. (incl. photos), 12 tables, 14 refs., 2 eqs. "Unpublished manuscript." **DWB**—Tropical cumulus cloud observations made from a calibrated PBY-6A aircraft are presented. The observations were made during Aug. 1956 in the vicinity of Puerto Rico, Barbados, and Trinidad in the Caribbean Atlantic region. Measurements of vertical drafts, temperature, humidity, and liquid water content were made through selected clouds and their nearby surroundings on eight different days. Supplementary data were spiral aircraft soundings, photography, surface ship observations (during part of the period) and the standard synoptic data from nearby stations. Limitations imposed by instrumental, reduction, and sampling problems were severe and are described. Nevertheless, some conclusions about tropical convection are possible: the most important is probably the controlling influence upon cloud structure and life cycle played by the synoptic situation and in particular by its divergence field. An interesting case of tropical disturbance passage (Aug. 15–16) is studied in detail, with joint cloud runs and synoptic analysis. For the remaining days, the cloud runs are presented with relatively little discussion. Tropical convection is seen to be marginal, with negatively buoyant cloud matter predominating these data. Active, buoyant bubbles are rare, although their apparent rarity may have been exaggerated by both instrumental and sampling problems. *Subject Headings:* **1. Tropical cloud studies 2. Airplane cloud observations 3. Caribbean Region.**—*A.A.*

12.8–360 551.576.1:551.577.21:551.509.324.2

Grigor'eva, A. S. and Drozdov, O. A., **K voprosu o primenenii kharakteristik vlagooborota kolichestvennomu prognozu osadkov.** [Application of moisture exchange characteristics o quantitative precipitation forecasting.] *Leningrad. Glavnaia Geofizicheskaia Observa-riia, Trudy*, No. 89:21–27, **1959.** 4 figs., 3 refs. **DLC**—The relationship of atmospheric ater content and relative humidity in a precipitation producing air mass to the subsequent mount of precipitation was investigated for 1951–1953 for southern European U.S.S.R. The tmospheric moisture content and the relative humidity were determined during the passage f the cyclones over the territory examined, while the precipitation was calculated as the verages for the territory for the subsequent days of cyclone passage. The dependence of oisture content upon precipitation showed an annual variation; the maximum precipitation or a given moisture content was observed in winter (Dec.–March), the next highest in Nov. nd the minimum in the summer months. When all precipitation is reduced to one tem-erature, corresponding to the ratio of the maximum water vapor content at this temperature nd dependence of precipitation upon relative humidity is determined, then the intra-seasonal uctuations in the dependence are found to disappear. In the case of small moisture content ne precipitation is practically independent of moisture content but for large (differing for ifferent months) moisture content on approximately linear relationship appears. The correla-on coefficient between total precipitation averaged per day during a cyclone passage, averaged erritory as a whole and the moisture content in the first day of cyclone incursion was +0.85 uring the warm period. In the winter period the correlation coefficient was +0.90. If the recipitation is calculated from the atmospheric moisture content and relative humidity at 50 or 700 mb surfaces a relationship is obtained between actual and calculated precipitation veraged per day for the entire territory in the case of small atmospheric moisture content. comparison of results obtained on the basis of the relationship of precipitation to moisture ontent with and without considering relative humidity indicates that the amount of precipita-on is substantially more accurate if relative humidity is considered. The application to orecasting is discussed. *Subject Headings:* **1. Precipitation forecasting 2. Water content-umidity-precipitation relationships 3. European U.S.S.R.**—*I.L.D.*

12.8–361 551.576.11

Ludlam, F. H. (*Imperial College, London*), **Cumulonimbus: new ideas on hail-, thunder-nd tropical storms.** *Schweizer Aero-Revue*, Bern, 32(4):213–216, April **1957.** 4 refs. **DLC.** lso issued as *Munitalp Foundation, Inc., Occasional Papers*, No. 0025, **1957.**—General in-ormation on recent discoveries and ideas on the physics of clouds (especially Cu and CuNb) ropical and temporate showers, glaciation of clouds, phases of thundercloud, hail, electricity, ornado and tropical cyclone development, etc. *Subject Headings:* **1. Cumulonimbus develop-ent 2. Cloud physics.**—*M.R.*

12.8–362 551.576.12(04)

Gauroy, P., **Dictionnaire des nuages.** [Cloud dictionary.] *Geographia*, Paris, 79:45–52, pril **1958.** fig., 6 photos. **DLC, NN, NIC**—Description of the various types of clouds, with mphasis on cumuliform clouds. Several photos with commentaries show the evolution of a loud system; rear, frontal and lateral skies of a cloud system. *Subject Heading:* **1. Cloud ictionary.**—*A.V.*

12.8–363 551.576.12:778.3

Kŏldovský, Milan, **Cloud photography for an amateur meteorologist.** *Weather*, London, 3(8):268–271, Aug. **1958.** 4 photos, 2 refs. **DWB**—The significance of cloud photography s a meteorological research tool is stressed. The author lists several points enabling the mateur to obtain better results by following advices given on cameras, lenses, films and lters. *Subject Heading:* **1. Cloud photography.**—*W.N.*

12.8–364 551.576.11:551.576.2(420):551.576.4

Jones, R. F. (*Met. Office, London*), **Layer cloud over southern England.** *Royal Meteoro-gical Society, Quarterly Journal*, 87(371):65–71, Jan. **1961.** 3 figs., 7 tables, 5 refs. **DWB, LC**—599 morning weather reconnaissance flights from the Royal Aircraft Establishment,

Farnborough, over a period of approximately four years have been examined to determine the frequency of occurrence and thickness of layer cloud over southern England. The chance of encountering 4/8 or more layer cloud in any kilometer height range decreased with height from about 1 in 2 near the surface to about 1 in 50 at a height of 12 km. Cloud layers when encountered were more likely to exceed one or two kilometers depth in the upper troposphere than in the lower, but the frequency of encountering a layer more than 1½ km deep was about 7 to 8% at all heights. About 1 in 9 of all flights encountered cloud above the melting level more than 3 km thick. An examination of clouds in the temperature band 0 to −15°C suggested that conditions suitable for severe clear ice formation on some aircraft might be encountered on about 1% of flights. The same examination suggests that seeding of layer clouds by silver iodide smoke should produce some detectable modification of the cloud sheet on about 8 days a year. *Subject Headings:* **1. Layer clouds 2. Aircraft icing 3. Cloud seeding with silver iodide 4. England.**—*Author's abstract.*

PRECIPITATION (551.577)

See also: **Rainfall interception by tropical forest, Uganda** (Hopkins), 12.8–89; **Measurements of radioactivity, Dresden/Wahnsdorf** (Marquardt), 12.8–100; **Radioactivity of aerosols of precip.** (Kopcewicz), 12.8–101; **Calculation of the need of water supply for grassland, Netherlands** (van Duin), 12.8–198; **Calculating winter precip., Kamennaia Steppe** (Kaulin), 12.8–224; **Measuring and mapping precip., Asiatic U.S.S.R.** (Levin, Miachikov), 12.8–225; **Calculating winter precip., Transvolga** (Razumikhin), 12.8–226; **Final Report 1956/1957 on Contract Cwb-9006** (Blue Hill Met. Obs.), 12.8–229; **Correlation and variability of precip. data** (MacDonald, Green), 12.8–230; **Precipitation in British Isles in relation to depression tracks** (Thomas), 12.8–289; **Results of calculations of significant precipitation amounts in Kharkov Province during exist of southern cyclones, Ukraine** (Faĭnergol'ts), 12.8–290; **Application of moisture exchange characteristics to precip. forecasting** (Grigor'eva, Drozdov), 12.8–360; **Aridity of the Marchfeld region, Austria** (Holzmann), 12.8–380; **Application of statistics to study of synoptic conditions of falling precipitation in Azerbaidzhan S.S.R.** (Koshinskiĭ), 12.8–393.

12.8–365 551.506.3:551.577:517.512.2

Mosetti, Ferruccio, **Analisi periodale di successioni pluviometriche applicata ascopo di previsione del ritmo di precipitazione su bacini idroelettrici.** [Harmonic analysis of precipitation series with application to forecasting rainfall variations of hydroelectric basins.] *Energia Elettrica*, Milan, 32(3):3–7, **1955.** 4 figs., table. Italian summary p. 1. **DLC**—The application of harmonic analysis to forecasting precipitation sequences and future precipitation is examined. Precipitation values for Vannino, Codelago, Goglia and Veranipio of the Ossola basin, Stricettes of the Lero-Mera basin, etc. for the 30 year period (1921–1951) were analyzed.

The sequence of observed values is given by an expression of the type $f(t) = \sum_{1i}^{n} a_i \sin(\omega_i t + \varphi_i)$.

The harmonic analysis selects the variables $a_i \sin(\omega_i t + \varphi_i)$ producing linear combinations for transforming $f(t)$ in the following manner $f(t) \rightarrow a_i \sin(\omega_i t + \varphi_i) +$negligible terms. The entire harmonic part of $f(t)$ is obtained by considering all the selected components $f(t) = \sum_{1i}^{n} a_i \sin(\omega_i t + \varphi_i) + R(t)$ where $R(t)$ is the analysis residual. Graphs of the precipitation components corrected according to the principle of homogeneity are presented for all the localities, and the precipitation for 1952 and 1953 is extrapolated and compared with observed values. The forecast for 1952 was found to be satisfactory; the mean error for the eight stations involved amounted to 9%; for 1953 the mean error was 8.7%. *Subject Headings:* **1. Harmonic analysis of precipitation data 2. Precipitation forecasting 3. Italy.**—*I.L.D.*

12.8–366 551.506.3:551.577.2(569.4)

*Israel. Meteorological Service, **Longterm climatic means, Pt. 1, rainfall.** (In its: **Book of ten years of the Meteorological Service of Israel** Tel Aviv, **1958.** p. 53–70. In Hebrew.

map, mostly tables.) **DWB** (M(06) I85se)—The article presents long term climatic means for rainfall. The first edition of long term means appeared in 1952 covering the period from 1901 to 1930, established in 1935 by the International Meteorological Organization in Warsaw and the standard period for normal value. But in the Second World Congress for Meteorology it was decided to compute means of thirty years for periods which end with a year ending in 0. The present means are for 1921–1950 and since they include data collected at 200 stations they are to be preferred to the previous means. The 200 stations mentioned are in addition to basic stations. Data not available at certain stations was made up by statistical calculations. In the preparation of table for 240 stations only annual quantities are used and not monthly readings. Monthly and annual rain amounts (Table 1) number of rain-days (Table II) for different regions are tabulated and average rainfall amounts (1921–50) are indicated on the attached map. *Subject Headings:* **1. Rainfall data, Israel 2. Long period records 3. Israel.**—*I.S.*

12.8–367 551.506.3:551.577.34(544)

*Rao, K. N., (*Met. Office, Poona*), **Some studies on rainfall of Rajasthan with particular reference to trends.** *Indian Journal of Meteorology and Geophysics*, 9(2):97–116, April **1958.** 8 figs., 9 tables, 6 refs., eqs. **DWB, DLC**—A critical examination of the rainfall of Rajasthan and its surrounding area has been made. Several references have been made to trends in rainfall and comparison of normals of different periods. The report contains an analysis of data of uniform period 1901 to 1950 and the examination of these long term records has revealed some features of interest. Besides the data of individual stations, a comparison of the district averages and of the subdivisions, east and west of Rajasthan for different periods has been made. On the whole this critical examination does not show any significant changes in the history of rainfall in the area. *Subject Headings:* **1. Rainfall studies 2. Rainfall trends 3. Normal period (1901–1950) 4. Rajasthan, India.**—*N.N.*

12.8–368 551.509.324.2:551.577.37

*†California. Dept. of Water Resources, **Procedures for estimating maximum possible precipitation.** Its *Bulletin* No. 88, May **1960.** 29 p. 16 figs. (some folded in Appendix), 4 tables, 26 refs., 42 eqs. **DWB** (M09.54 C153pro)—A report on procedures for estimating maximum possible precipitation for large watersheds in California. The investigation applies the extreme values of known meteorological parameters to an atmospheric model in order to estimate the maximum accumulated precipitation and its distribution for the Feather River Basin. An electronic computing program was developed to obtain fairly detailed geographic distributions of the maximum possible precipitation. A physical model and numerical methods have been devised for the computation of maximum possible precipitation produced by orographic ascent and large scale synoptic processes over large watersheds. The spillover and its geographical distribution can be calculated with the assumption of uniform but extreme drop size. A 72-hour isohyetal map for the "near-maximum" storm has been calculated. A machine program now exists so that the distribution of maximum possible precipitation over a large watershed may be computed given the geometry of the terrain simplified profiles, the extreme values of certain meteorological parameters and the critical period $T_0(t_1)$. Certain limitations in the methodology of the study are indicated. Maps, charts and graphs used in the study or resulting from this study are included in the appendix. *Subject Headings:* **1. Hydrometeorological studies 2. Precipitation estimation 3. Maximum possible precipitation 4. California.**—*E.Z.S.*

12.8–369 551.577.52

Whiten, A. J., **Accomplishment and rumour.** *Weather*, London, 14(6):208–210, June **1959. DWB**—Drogaitsev, a Russian marine meteorologist, explained that measurements showed beyond reasonable doubt that local precipitation had been substantially increased by the presence of new forests. He discounted many notions of gigantic achievements. Both he and the writer expressed an interest in long range forecasting for its benefit in agricultural management but both disclaimed any effort to modify rainfall patterns over large areas. Some improvements on the Volga are mentioned. *Subject Heading:* **1. Precipitation effects on agriculture.**—*E.Z.S.*

RAIN, SNOW AND HAIL (551.578)

See also: **Hail in Poland,** 12.8–20; **Wind-drifted snow, Charcot Station** (Garcia), 12.8–47; **Radiation studies on south polar snowfield** (Hanson), 12.8–48; **Snow drift and engineering design, Arctic** (Gerdel), 12.8–104; **Deformation of Ross Ice Shelf** (Zumberge et al.), 12.8–208; **Nourishment of glacial cover in Novaya Zemlya** (Svatkov), 12.8–209; **Shape and falling velocity of water and raindrops** (Shupiatskiĭ), 12.8–249; **Diffusion theory applied to radiant energy distribution and albedo of snow** (Giddings, LaChapelle), 12.8–313; **Wind transport of Antarctic snow** (Vickers), 12.8–347.

12.8–370 551.578.465(99)

Vickers, William W. (*Arctic Inst. of North America*), **Antarctic snow stratigraphy.** *American Geophysical Union, Transactions,* 40(2):181–184, June **1959.** fig. **DWB, DLC**—Layering visible in the walls of pits dug in the snow at several IGY scientific stations was studied in order to determine the pattern and rate of snow accumulation in the Antarctic. A profile of snow stratigraphy at Little America III, Station Cruiser is included. It is noted that melt crusts affect grain size in the underlying snow layers. Examination of older layers reveals considerably greater grain size than in the newer layers. This grain size phenomenon, and its manifestation in ramsonde and density tests, is the only stratigraphic indicator found thus far in the snow pits of the high plateau country, which represents most of the Antarctic continent. *Subject Headings:* **1. Snow stratigraphy 2. Snow metamorphosis 3. Little America III, Antarctica.**—*E.Z.S.*

12.8–371 551.578.7

Macklin, W. C. and Ludlam, F. H. (*both, Imperial College, London*), **The fallspeeds of hailstones.** *Royal Meteorological Society, Quarterly Journal,* 87(371):72–81, Jan. **1961.** 5 figs., 3 tables, 8 refs., 2 eqs. **DWB, DLC**—Measurements have been made of the speeds of ice objects resembling hailstones during free fall, and of the drag coefficients of such objects and of natural hailstones. It has been found that the drag coefficients range from those of spheres (about 0.45) to about 0.8, depending on the shape and surface characteristics of the stone. *Subject Headings:* **1. Hailstone fallspeeds 2. Hailstone terminal velocities.**—*Authors' abstract.*

HYDROMETEOROLOGY (551.579)

See: **Transactions of Colloquium of Hannoversch-Münden** (IUGG), 12.8–2; **Fundamentals of hydrology** (Bogomolov), 12.8–10; **Development of hydrol., U.S.S.R.** (Fedoseev), 12.8–13; **Moisture availability for maize, Ukraine** (Kekukh, Mikhailova, 12.8–86; **Items,** 12.8–198 to 12.8–206; **Investigation of flood producing storms in Illinois** (Huff, Semonin), 12.8–267; **Aridity of the Marchfeld region, Austria** (Holzmann), 12.8–380.

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY (551.58)

See: **Amount of solar radiation in a zonal area between two parallels of latitude** (Fukui), 12.8–309.

CLIMATE OF PARTICULAR PLACES (551.582)

See also: **Climate, Ariz.,** 12.8–15; **Climat. zones, E. Antarctica** (Bugaev), 12.8–46; **Met. of East Antarctica** (Gusev, Rusin), 12.8–51; **Historical weather from 1851–1883, Japan** (Amano), 12.8–59; **Climatic data, 1621–1650, according to obs. of Count Herman IV of Hesse** (Lenke), 12.8–60; **Bibliog. of climate, Norway** (Creasi), 12.8–65; **Agric. statistical summary** (Florida Marketing Bureau), 12.8–83; **Measuring and mapping precip., Asiatic U.S.S.R.** (Levin, Miachikov), 12.8–225; **Fifteen years of obs., Lomnitz Peak** (Petrovič), 12.8–232; **Monthly climatic data, U. S., West Indies, Pacific islands** (U. S. W. B.), 12.8–319.

12.8–372 551.506.3:551.582.2(436)

*Roller, Maria, **Die 105-jährigen meteorologischen Beobachtungen in Linz von 1852 bis 1956.** [105 years of meteorological observations in Linz, 1852–1956.] *Wetter und Leben*

Vienna, Sonderheft, No. 6:87–152, 1959. 33 tables. **DLC**—After giving a history of weather observation stations in Linz during 1852–1956, the author presents 33 tables giving the following meteorological data for Linz: general geophysical constants; solar altitudes on the 15th of every month; intensity of solar radiation at 390 m altitude during the individual month as a function of solar altitude; monthly and annual means of sunshine duration in hours; locally possible sunshine duration at 5 localities; monthly and annual means of air temperature in °C for individual years from 1852–1956; means of air and ground temperature in the vicinity of Linz according to observations between 1912– and 1957 at Weingartshof, Alkoven, Polsing, etc.; comparison of temperature and humidity observations of the city of Linz with those in the surrounding open country in the middle of the period July 1948–June 1957; mean daily extremes of air temperature in Linz and mean daily fluctuation; absolute monthly and annual maxima and minima of air temperature for 1852–1956; number of summer days and tropical days (1931–1956), of frost days, ice days and alternating frost days during the winters 1920/21–1956/57; etc. *Subject Headings:* **1. Meteorological data for Linz 2. Long period records 3. Linz, Austria.**—*I.L.D.*

CLIMATIC CHANGES (551.583)

12.8–373 551.583:551.510.41:546.264

London, J. (*N. Y. Univ.*); Willett, H. C. (*M. I. T.*) and Roberts, Walter Orr (*High Altitude Obs.*), **Carbon dioxide theory of climatic control.** *Colorado. Univ. High Altitude Obs. Inst. for Solar-Terrestrial Research, Technical Report,* No. 1, Corrected and reissued May **1957.** p. 88–90 2 refs. **DWB** (M13.1 C719t)—The paper discusses the mechanism of climatic changes due to the carbon dioxide content of the atmosphere, effective variations on surface temperature, short wave solar radiation, the characteristics of glaciations, and the relationship to oceans. The present CO_2 content of the atmosphere is about 0.033% by volume, and if this amount were to be halved, the surface temperature would decrease by 3.8°C. It has been stated that there has been an increase in CO_2 content from 0.2% in 1900 to 0.030% in 1940. From these calculations there has developed an observation on the relation between a regulatory effect of CO_2 to the surface layer and to solar radiation. *Subject Headings:* **1. Carbon dioxide in the atmosphere 2. Climatic controls 3. Carbon dioxide effects on climate.**—*K.C.*

12.8–374 551.583.15

Callendar, G. S., **On the present climatic fluctuation.** *Meteorological Magazine,* London, 87(1033):204–207, July 1958. 3 figs., 19 refs. **DWB, DLC**—Temperature trends are discussed here in an attempt to interpret the term "present climatic fluctuation" as a phenomenon of the 20th century. The essential difference between local fluctuations and longer trends over wider areas are graphically presented. Decadal averages for 1910–1950 for Stornoway, Kew and Vienna show fluctuations. Regional fluctuations are shown in 30 years, ending of curves for the period 1880–1960. The warmest period in the extreme north-west was 1931–1940, and 1943–1952 in the south-east. The cold spell 1940–1942 in Central Europe did not reveal any significant slow down in the retreat of Norwegian or Alpine glaciers. Regional trends are shown in curves for Stykkisholm, Iceland (21/2°F), Trondheim, Norway; Uppsala, Sweden, Aberdeen, Scotland (1.2°F), Greenwich, Eng. (1°F), and Vienna, Austria (0.9°F). Comparisons show good agreement, large scaled. *Subject Headings:* **1. Climatic trends 2. Temperature trends 3. Europe.**—*W.N.*

12.8–375 551.583.15(522.1) 551.524.36(522.1)

Kojima, T., **On the climatic change at Fukuoka during the cold season.** *Journal of Meteorological Research,* Tokyo, 11(8):723–725, Aug. 1959. 8 figs., 2 refs. In Japanese. **DWB, DLC**—In order to investigate climatic change, seven climatic factors were selected, such as precipitation in winter, mean air temperature and mean minimum temperature, polar of minimum air temperature and days below 0°C, snow and frost days, etc. The investigation was based on the data for 1891–1957. The results obtained by statistical computation are as follows: 1) there is not an ascending trend of precipitation, although recent precipitation shows higher than that in average year; 2) cycle of cold winter is in every 25 years and in prospect 1960 will be the year of cycle; 3) warm winter is in uncertain cycle; 4) number of snow and frost days

are not in proportion to the air temperature in winter. *Subject Headings:* **1. Local climatic studies 2. Winter season, Fukuoka 3. Fukuoka, Japan.**—*K.C.*

12.8–376 551.506.3 :551.583.2

Wagret, Paul, **Le climat se réchauffe-t-il?** [Does climate become warmer?] *La Nature, Paris*, 3273 :19–23, Jan. **1958.** 7 figs. **DLC.**—The northwards retirement of frozen soils (merzlota), the retirement of the ice bank and glaciers in the northern hemisphere indicate that terrestrial climate undergoes a quick warming up. Evolution of fauna and flora in the northern regions bears out this warming up, which appears less clearly in the southern hemisphere. *Subject Headings:* **1. Climatic changes 2. Warming up of climate.**—*A.V.*

12.8–377 551.583.3 :551.332.5 (234.9)

Moskvitin, A. I., **Novye svidetel'stva drevneĭshego oledeneniia Russkoĭ ravniny.** [Recent evidence for a more ancient glaciation of the Russian plain.] *Akademiia Nauk SSSR, Doklady*, 127 (4) :852–855, **1959.** 3 figs., 10 refs. **DWB, DLC**—In connection with earlier attempts to confirm suppositions of very great "Pliocene" or Akchagyl' age of the moraine of the first glaciation of the Russian plain, the author presents new observations on the very manipulations of permafrost in the Akchagyl sands observed in 1958 by a large group of specialists on the Quaternary. The results of examinations of unevenings of extensive sand qualities at Rostov-on-the-Don and Erganian strata on the lower reaches of the Sal River are described. Both points lie much above sea level and at a rather low latitude so that the traces of frost within them can be regarded as evidence for simultaneous development of intensive glaciation on the Russian platform and on the Caucasus. *Subject Headings:* **1. Glacial period moraines 2. Russian plain 3. Climate changes 4. Caucasus, S.S.R.**—*I.L.D.*

12.8–378 551.583.3 :551.324.28 (99)

Thomas, Charles W. (*Univ. of Wash., Seattle*), **Late Pleistocene and recent limits of the Ross Ice Shelf.** *Journal of Geophysical Research*, Wash., D. C., 65 (6) :1789–1792, June **1960.** 2 figs., 3 tables, 6 refs., 2 eqs. **DLC**—Investigation of ocean-bottom cores in polar regions has shown that strata lacking in skeletal remains of organisms are an indication of conditions during which a snow cover on sea prevented the transmission of short-wave radiation from atmosphere to sea water. The presence of organic remains, on the other hand, is indicative of 'warm' periods during which solar energy was available for photosynthesis by holophytic plankton. In this paper results of examination of two cores from the south edge of the Ross Sea are reported. The cores have been correlated with horizons dated by the carbon-14 method. The presence in the sediments of volcanic ash deposited by the wind at times when parennial sea ice blanketed the region is puzzling. Calculation of rates of penetration of sedimentary material under conditions of a cold environment discloses the mechanism of bottom sedimentation through sea ice with a snow cover. The evidence of the sediments indicates that the Ross Ice Shelf has not advanced materially beyond its present northerly limits during late Pleistocene and Recent time. *Subject Headings:* **1. Pleistocene climate 2. Ross Ice Shelf, Antarctica.**—*Author's abstract.*

12.8–379 551.583.3 :550.9 :552.1 (99) :535.37

Zeller, E. J. and Pearn, W. C. (*both, Dept. of Geology, Univ. of Kansas*), **Determination of past Antarctic climate by thermoluminescence of rocks.** *American Geophysical Union, Transactions*, 41 (1) :118–121, March **1960.** 2 figs. **DWB, DLC**—Antarctic rock samples were collected and analyzed as part of the IGY program. From their thermoluminescence characteristics, an approximate upper limit for rock temperature in parts of Antarctica in the geologically recent past were estimated. Tentative influences regarding past climatic conditions, in particular the minimum length of time the Antarctic climate has been frigid, have also been made. The present paper reports these studies and findings. *Subject Headings:* **1. Antarctic climatic history 2. Thermoluminescence of rocks.**—*I.S.*

12.8–380 551.583.3 :551.577.38 :551.579

Holzmann, Gustav (*Vienna*), **Zur Trockenheit des Marchfeldes.** [Aridity of the Marchfeld region.] *Wetter und Leben, Vienna*, 10 (5/7 :90–92, **1958.** 3 refs. **DLC**—In recent years the

cause of the desiccation of the Marchfeld has been attributed to the interference of the regulation of the Danube in cultivation processes and a presumably causal relationship has been established between the ground water level and the hydraulic measures in the Danube region. The zone of dependence of the ground water situation upon variations of the Danube extends at most 2–4 km inland; before the diking this zone must have extended farther into the interior of the Marchfeld region. Attempts have been made to show that the desiccation of the region is associated with the recent warming of the climate. Historical data indicate that during the middle of the 19th century the ground water level at some points was higher and farther in the interior. But these data also show that the soil moisture was influenced only by the frequency and intensity of precipitation and that good crop yields did not depend upon ground water level. In general the ground water level does not appear to have been higher during earlier periods, when ecological conditions were more favorable. In the 18th century the absence of a scientific agriculture led to permanent poor harvests as a result of continued climatic drought and periodically occurring floods. Improved agricultural techniques and prevention of floods has brought about higher yields despite climatic aridity and less ground water level. *Subject Headings:* **1. Aridity 2. Climatic fluctuations 3. Ground water levels 4. Marchfeld region.** —*I.L.D.*

12.8–381 551.583.7:551.521.11(52)

Tsuchiya, I., **On the variation of the percentage of recent Japanese sunshine hours (On the palaeo-climatology and the variation of climatic types, pt. 2).** *Journal of Agricultural Meteorology, Tokyo*, 11(1):33–34, July **1955.** fig., 10 refs. In Japanese. **DWB** —In regard to the study of old climate and its variation, the percentage of sunshine in twelve areas throughout Japan has been adopted to investigate the tendency of variation, and the monthly rate for 1901–1925, and for 1926–1950. The distribution curve on the frequency at each 5% was made and compared with two periods. Again, only for the months of January and July, 5-year means of the percentage of sunshine were given in Fig. 1 dealing up to 1953. The characteristics of monthly tendency of variation are summarized and the maximum year and the type of distribution in climate is discussed. Brief survey was made on the relation of sunshine hours and the distribution of air pressure, sunspots, storms and clouds, wet-warm winter, and solar variation. *Subject Headings:* **1. Sunshine variations 2. Japan.**—*K.C.*

MICROCLIMATOLOGY (551.584)

See also: **Rainfall interception by tropical forest, Uganda** (Hopkins), 12.8–89; **Glacier studies of McCall Glacier** (Sater), 12.8–207; **Phenology of an Alpine valley, Bavaria** (Frenzel, Fischer), 12.8–238.

12.8–382 551.584.5:551.510.41:546.262

Lampert, F. F., **Opyt gigienicheskogo izucheniia vliianiia garazheĭ i benzokolonki, raspolozennykh vnutri zhilykh kvartalov, na sanitarnye usloviia prozhivaniia naseleniia.** [A hygienic investigation of the effect of garages and pumps, situated in residential districts, on the local sanitary conditions of the population.] *Gigiena i Sanitariia*, Moscow, 24(3):74–76, March **1959.** 2 tables. **DLC** —A study carried out in Moscow in 1957 by means of laboratory investigations and inquiries among the population showed that the presence of automobile garages and gasoline pump stations in residential districts is often the cause of air pollution exceeding the permissible quantity of carbon monoxide, especially after the conversion of the city's automobile fleet to ethylated gasoline. Tables showing the concentration of carbon monoxide in the air of garages and pump stations, as well as in apartments in their vicinity are presented. *Subject Headings:* **1. Air pollution 2. Carbon monoxide in the atmosphere.** —*A.M.P.*

12.8–383 551.584.5:551.510.42:547.681

Sawicki, Eugene; Elbert, W.; Stanley, Thomas W. et al. (all, *U. S. Dept. Health, Educ. & Welfare, Cin., Ohio*), **The detection and determination of polynuclear hydrocarbons in urban airborne particulates, Pt. 1, The benzopyrene fraction.** *International Journal of Air Pollution*, N. Y., 2(3):273–282, March **1960.** 10 figs., 4 tables, 6 refs. **DWB, DLC**—A new simple

procedure for the determination of benzo(a)pyrene in complex mixtures is introduced. A comparison of the concentration of benzo(a)pyrene in the air of nine cities for the month of Nov., 1958, is given. Evidence is presented for the identification of each hydrocarbon found in benzopyrene fraction. The relative concentration of benzo(a)pyrene, benzo(e)pyrene, benzo(k)fluoranthene and perylene in the nine cities is approximately constant. *Subject Headings:* **1. Polynuclear hydrocarbons 2. Atmospheric pollution in cities. I. Hauser, Thomas R. II. Fox, F. T.**—*Authors' abstract.*

12.8–384 551.584.61:551.573:643.58:628.82

Ash, Robert S. (*Int. Metal Prod. Co. Phoenix*), **New uses for evaporative cooling.** *Air Conditioning, Heating and Ventilating*, N. Y., 56(10):64–66, Oct. 1959. 3 figs., 3 tables. **DWB, DLC**—An engineering approach to show how evaporative cooling is practical for use in laundries and for providing relief where hot spot areas exist. *Subject Headings:* **1. Evaporative cooling 2. Air conditioning.**—*Author's abstract.*

CLIMATIC CLASSIFICATION (551.585)

See also: **Climat. zones, E. Antarctica** (Bugaev), 12.8–46.

12.8–385 551.588.6 551.585:634.94(54)

Janaki Ammal, E. K. (*Central Botanical Lab., Botanical Survey of India*), **Report on the humid regions of South Asia.** (In: UNESCO, **Problems of humid tropical regions,** Pub. Paris, UNESCO; London, N. M. Stationery Office, 1958. p. 43–53. 3 figs., 25 refs. French summary p. 52.) **DLC** (SB111.U56)—The rain forests of India, Pakistan, Burma and Ceylon are discussed in order to demonstrate the vicious circle human influence on forest, forest influence on climate, the latter reflected in the almost annual floods in the plains. Mapped and tabulated classifications of climatic zones and rain forests are given, along with description of flora and fauna. The future program for the study of South Asian rain forests ought to be part of a worldwide scheme, including meteorological, cytological, ecological and ethnobotanical studies and mapping. *Subject Headings:* **1. Humid tropics 2. Rain forest economy 3. India 4. Pakistan 5. Burma 6. Ceylon.**—*W.N.*

12.8–386 551.585.9:551.459:581.9(98)

†Aleksandrova, V. K. (*Komarov Botanical Inst., U.S.S.R.*), **Some regularities in the distribution of the vegetation in the Arctic tundra.** *Arctic*, Montreal, 13(3):147–162, Sept. 1960. 6 figs., bibliog. p. 160–162. **DLC**—The vegetation in the Arctic tundra is described. The term "Arctic tundra subzone" is applied to northernmost floristic subzones in U.S.S.R. since 1930. This zone is characterized by the absence of shrubs and occurrence of dry Dryass-moss communities. There are many variations in the zone. In Novaya Zemlya, the flora is influenced by maritime climate. The youthfulness of flora in that region can also be explained by lack of endemics. The different types of vegetation found in the South Island of Novaya Zemlya is also described. *Subject Headings:* **1. Arctic tundra vegetation 2. Tundra 3. Novaya Zemlya.**—*A.H.K.*

BIOCLIMATOLOGY (551.586)

See: **Proceedings of symposium held at Uccle, Oct. 1958,** 12.8–6; **Meteorobiol. and atmos. elec.** (Reiter), 12.8–14; **Potato blight epidemics** (Cox, Large), 12.8–27; **Biol. of southern cold temp. zone** (Pantin), 12.8–53; **Items,** 12.8–84 to 12.8–87; **Items,** 12.8–90 to 12.8–96; **Phenology of an Alpine valley, Bavaria** (Frenzel, Fischer), 12.8–238; **Meteorology, newest region of exploration** (Robinson), 12.8–282; **Days with free föhn and their biological significance** (Undt), 12.8–345.

UPPER AIR CLIMATOLOGY (551.587)

See: **Absolute topography of 850 mb, 700 mb and 300 mb surfaces from 1900–1939, N. Hemisphere** (Hennig), 12.8–236.

ENVIRONMENTAL INFLUENCE (551.588)

See also: **Colloquium of Hannoversch-Münden** (IUGG), 12.8-2; **Carbon^{14} content of urban airborne particulate matter** (Lodge et al.), 12.8–278; **Report on the humid regions of South Asia** (Janaki), 12.8–385.

12.8–387 551.588.1:003.1

Davitaia, F. F.; Drozdov, O. A. and Rubinshteĭn, E. S., **Klimaticheskie resursy i perspektivy ikh ispol'zovaniia v narodnom khoziaĭstve.** [Climatic resources and perspectives of their use in national economy.] *Meteorologiia i Gidrologiia*, Moscow, No. 4:3–9, April **1960. DWB, DLC**—The author discusses the importance of the study and use of the climatic resources in the national economy of the U.S.S.R. with reference (1) to the studies on agricultural climatology carried out in connection with the development of the virgin lands in Central European Russia, Kazakhstan, etc.; (2) the establishment of agroclimatic regions; (3) the use of climatic data and research in medical climatology (establishment of health and bathing resorts). The heterogeneity of the process of climatic change is stressed and the widely held opinion that the climatic warming cycle has run its course, is shown to be not valid for various areas in Soviet Asia. Thus in the higher latitudes the winter temperature has continued to be above the normal up to the present; in Central Asia and the Caucasus the temperature change is opposite to that in the northern latitudes; the April temperature of Western Siberia has risen considerably and in the Barents Sea the ten yr temperature has risen during the past yrs by 5°C., etc. The significance of precipitation fluctuation in ecology is considered briefly. Further prospects of the utilization of climatic resources are considered, namely, the utilization of available soil heat and moisture after the harvest, the cultivation of varieties of crops capable of maximum utilization of the heat and water resources, the utilization of wind and solar energy, etc. *Subject Headings:* **1. Agricultural climatology 2. Medical climatology 3. Human ecology 4. Climatic resources 5. U.S.S.R. economy.**—*I.L.D.*

12.8–388 551.588:551.46(265)

Ogata, T.; Kitamura, N. and Mori, Y., **On the meteorological condition near the sea surface at "Tango," Pt. 2,** *Journal of Meteorological Research*, Tokyo, 10(9): 792–797, Sept. **1958.** 6 figs., 2 tables, 11 refs. In Japanese; English summary, p. 792. **DWB, DLC**—As a sequel of the preceding report (Part I), the authors examined the evaporation from the sea surface at "Tango" (29°N, 135°E), and obtained results are as follows: (1) July . . . 3.85 mm/day; Aug. . . . 5.33 mm/day. We have compared these values with those calculated from Jacob's evaporation formula. Its ratios are 1.47 (July) and 1.17 (Aug.). The results are nearly equal to the results of last year (1956) observations (see Part I), and observed (calculated) amount of evaporation for July 1957 is 0.48 (0.54) times of that for July 1956. (2) We found a much wet layer near the sea surface by radiosonde observations. Its height is nearly 200–400 meters in case of most stable stratification. *Subject Headings:* **1. Radiosonde observations 2. Evaporation from sea surfaces 3. Tango, Japan.**—*Authors' abstract.*

12.8–389 551.588.1:551.46(265)

Ogata, T.; Kanazawa, M. and Kitamura, N., **On the meteorological conditions near the sea surface at "Tango," Pt. 3.** *Journal of Meteorological Research*, Tokyo, 10(11):911–916, Nov. **1958.** 2 figs., 5 tables, 6 refs., 8 eqs. In Japanese; English summary, p. 911. **DWB, DLC**—Pt. 1, *ibid.*, 10(3):164–172, see Met. Abs. 10.5–101, 1958. The authors examined the observational errors of wind velocity on the observation ship. (1) By rolling of the ship, the observed wind velocity is larger than the actual one.

~0.03%	at 1 m height
0.8~0.9%	at 3 m height
2~3%	at 11 m height

(2) Error of wind velocity by height variation of sea surface by wave is 0.3% for the case of the maximum wave height 1 m. *Subject Headings:* **1. Sea surface meteorology 2. Wind velocity at sea surface 3. Tango, Japan.**—*Authors' abstract.*

12.8–390 551.588.1:551.46(265)

Ogata, T., **On the meteorological condition near the sea surface at "Tango," Pt. 4.** *Journal of Meteorological Research*, Tokyo, 11(7):607–613, July **1959.** 7 figs., 3 tables, 9 refs., 4 eqs. In Japanese; English summary p. 607. **DWB, DLC**—As a sequel of the preceding reports (Pts. 1–3), the author examined the vertical distribution of wind speed near the sea surface and the evaporation from the sea surface, the vertical distributions of air temperature, and the relative humidity in the layers up to an altitude of 700 m above the sea at 29°N and 135°E. The results are as follows: 1) from computations of wind speed at heights of 38 cm on the raft, 285 cm, 645 cm and 1155 cm above the sea surface, the shearing stress of wind on sea waves was about 0.13 cyne cm^{-2} in about 7 m sec^{-1}, 2) the results of observation for 3 yrs (1956–58) of evaporation amount from the sea surface was tabulated as well as annual variation of monthly mean values of evaporation, wind speed and temperature difference between air and sea water surface, 3) considerable wet layer was found at 350 m level above the sea surface by radiosonde observations in case of most stable stratification, 4) H. U. SVERDRUP's theoretical formula agreed with the results of practical observation. *Subject Headings:* **1. Sea surface micrometeorology 2. Tango, Japan.**—*K.C.*

12.8–391 551.588.2:551.513.2:551.557.5(235.2)

Morozova, M. I.; Petrosiants, M. A.; Chernysheva, I., **Osobennosti vozdushnykh techenii nad Pamirom i Zapadnym Tian'-Shanem.** [Characteristics of air currents above the Pamirs and western Tian-Shan.] *Meteorologiia i Gidrologiia*, Moscow, No. 9:3–12, Sept. **1959.** 4 figs., 1 table, 12 refs. **DWB, DLC**—Since 1956 the Institute of Mathematics and Mechanics of the Uzbek S.S.R., the Central Asian Scientific Hydrometeorological Institute, etc. have been investigating the structure of the jet stream and the course of synoptic processes in mountain regions. In this study the authors analyze the atmospheric circulation during the summer and fall on the basis of aerological data obtained during 1956 and 1957. Four mean vertical sections are presented: two of these through meridian 64°C long. pass through lowlands and two through meridian 73°E long. pass through mountainous regions. During summer the variation of wind in a horizontal direction in the lowlands of Central Asia does not differ substantially from that over the European S.S.R. The jet stream is manifested by a vertical wind shift which, below the axis of the jet, has a value of the order of 5×10^{-3} sec^{-1} as compared with the characteristic magnitude of 2×10^{-3} sec^{-1}. In the mountain region 3 wind maxima are present in the central part of the jet stream. The maxima over Dzhambul-Ankit (12–13 km) and over Osh-Sary-Tiash' (12–16 km) are associated with local jet streams resulting from orographic effects. The horizontal gradients of the meteorological elements over the mountain region is 3 to 5 times that over the lowlands. This is also true of the jet streams. The formation of jet streams at the boundaries of mountains is associated with increase in baroclinicity due to greater amounts of heat arriving during summer than at similar levels over lowlands. Over the mountains the maximum vertical currents are observed at 10–11 km above sea level as compared with 5–6 km over the lowlands. The change in the structure of the wind field from lowlands to mountains is explained by the baroclinicity along the northern half of the Central Asian mountains so that the wind speed is increased in the entire troposphere. The behavior of the wind field in the fall months is described and explained. Under the influence of the mountain, the wind field was found to extend at least up to 16 km. about 3–4 times the height of the mountains themselves. *Subject Headings:* **1. Air currents 2. Pamirs 3. Tian-Shan,**—*I.L.D.*

12.8–392 551.588.2:551.510.62

Tomlinson, H. T. (*Chance-Vought Aircraft Corp., Arlington, Tex.*) and Straiton, A. W. (*Univ. of Texas, Austin*), **Analysis of 3-cm radio height-gain curves taken over rough terrain.** *Institute of Radio Engineers, Transactions on Antennas and Propagation*, Vol. AP-7(4):405–413, Oct. 1959. 27 figs., (incl. photos), table, 3 refs., 4 eqs. **DLC**—This report describes the effect of terrain and meteorological conditions on the height-gain pattern of 3.2-cm radio waves over various short transmission paths. Equivalent reflection coefficients are obtained and potential reflection areas are investigated. A study of time variations in the height of nulls in the signal strength pattern is made and the relationship between movement of the nulls and the corresponding refractive index distribution is considered. *Subject Headings:* **1. Height gain**

patterns of radio waves 2. Topographic effects 3. Meteorological effects on radio waves.—*Author's abstract.*

SYNOPTIC CLIMATOLOGY (551.589)

See also: Synoptic climat., Western Cordillera, Canada (Walker), 12.8-16.

12.8–393 551.589 551.509.318:551.577.1(479.24)

Koshinskiĭ, S. D., **Primenenie statistiki pri issledovanii sinopticheskikh uslovii vypadeniia osadkov v Azerbaĭdzhane.** [The application of statistics to the study of synoptic conditions of falling precipitation in Azerbaidzhan.] *Meteorologiia i Gidrologiia*, Moscow, No. 9:23–26, Sept. 1960. 2 figs., 2 tables, 2 refs. **DWB, DLC**—A study is made of the rainfall during the growing season, April–Oct., in the main cotton growing regions of the U.S.S.R. and in the Lenkoransk region. Histograms are given showing the percentage of the occurrences of precipitation, more than 0.3 mm. in 12 hrs which occur, (a) when various types of anticyclonic weather are prevailing i.e. polar anticyclones, Azores anticyclones, Siberian anticyclones, and (b) with various types of cyclonic processes i.e. South Caspian cyclone, cold front, depression. Graphs are drawn showing the frequency of occurrence of rainfall with various intensities of the different anticyclones. The data used in the construction of these graphs for the Azores anticyclone and the Polar anticyclones are tabulated. *Subject Headings:* **1. Synoptic climatology 2. Summer rainfall 3. Azerbaidzhan, U.S.S.R.**—*R.B.*

MISCELLANEOUS

COSMIC INFLUENCES (551.590)

See: **Proceedings of symposium held at Uccle, Oct. 1958,** 12.8–6.

OPTICAL PHENOMENA (551.593)

See also: **Atmospheric optics** (Tikhov), 12.8–1; **N_2^+ ions in upper Antarctic atmos.** (Weill), 12.8–49.

12.8–394 551.510.62 551.593.1:551.521.3

†Williams, N. R., **Optical and radio refractive indices and horizons-theory and application.** *U. S. Naval Missile Center, Point Mugu, California, Technical Memorandum* NMC-TM-59-21, Aug. 31, 1959. 33 p. 4 tables, 33 refs., 32 eqs.—A short review of the basic physical principles of refraction is followed by discussion of refractive index and "horizon" formulas for both the optical and radio band. Typical indices and horizons for representative air masses are computed, particularly for equatorial and North Pacific Ocean stations. *Subject Headings:* **1. Radio refractive index 2. Optical refractive index 3. Atmospheric refraction 4. Equatorial Pacific Ocean 5. North Pacific Ocean.**—*Author's abstract.*

12.8–395 551.593.5:535.4

Indiana. University. Dept. of Chemistry, **Molecular light scattering.** Its Contract AF 19(122)–400, Final Report, Aug. 27, 1954. 24 p. 6 figs., 7 tables, 28 eqs., 22 refs.—The theory of molecular scattering is outlined, reducing it to Stoke's parameters and scattering metrics. Right and oblique angle scattering cells were used in combination with a photometer to obtain an experimental verification. Among the experimental results discussed is the change of scattering with wavelength; the relative scattering power of some gases and vapors, depolarization factors at various atmospheric pressures and the effect of ultraviolet light. *Subject Heading:* **1. Light scattering.**—*A.A.*

12.8–396 551.593.62

Pilsbury, R. K., **Unusual rainbow phenomenon.** *Meteorological Magazine*, London, 82(968):55–56, Feb. 1953. fig., 2 refs. **DWB**—Oct. 22, 1952, near London, primary and secondary bows and between them an arc with opposite curvature. Cause not known. *Subject Headings:* **1. Rainbows 2. London, England.**—*C.E.P.B.*

12.8–397 551.593.63

Smith, D. E.; Lacy, R. E. and Nicholson, G., **Halo-phenomena on 5 February.** *Weather*, London, 9(7):222, July 1954. fig. **DWB**—At Hendon, Welwyn and Teddington, all near London, observers saw 22° and 46° halos, mock suns, sun pillar, circumzenithal arc. *Subject Heading:* **1. Halo observations.**—*C.E.P.B.*

12.8–398 551.593.62

Watson, L. E., **Rainbow phenomenon.** *Meteorological Magazine*, London, 82(973):218, July 1953. fig. **DWB**—At Benbecula, Outer Hebrides, rainbow arcs were observed, curved in opposite direction to primary bow. *Subject Heading:* **1. Rainbows.**—*C.E.P.B.*

12.8–399 551.593.63

Solar halo, Great Australian Bight, *Marine Observer*, 24(166):211, Oct. 1954. fig. **DWB**—Oct. 14, 1953, besides ordinary 23° halo, a second halo of 23° radius was centered below sun. *Subject Heading:* **1. Halo observations.**—*C.E.P.B.*

12.8–400 551.593.63

Valette, L. G., **Die Erscheinung vom 14 Juli 1865 am Matterhorn.** [The phenomenon on the Matterhorn on July 1865.] *Les Alpes*, Berne, 33:81–85, **1957. NN**—An optical phenomenon was described and sketched by WHYMPER and three days later by FATHER GORRET. After considering meteorological conditions and comparing the description of the phenomenon with other observations, the author concludes this phenomenon was a reflection of a solar halo. *Subject Headings:* **1. Solar halo 2. Matterhorn (Switzerland).**—*A.V.*

12.8–401 551.593.63

Vonwiller, O. U., **Observation of a mock moon.** *Australian Journal of Science*, Sydney, 19(3):114–115, Dec. **1956. DLC**—Description of the rare phenomenon of a paraselene, made by a careful and qualified observer. *Subject Headings:* **1. Paraselene 2. Optical phenomena.**—*A.A.*

12.8–402 551.593.65

Currie, Gordon, **Sunset at Great Smeaton.** *Weather*, London, 9(3):94–95, March 1954. **DWB**—Detailed description of cloud changes and spectacular sunset of Aug. 28, 1953 and subsequent weather. *Subject Heading:* **1. Cloud coloration.**—*C.E.P.B.*

ELECTRICAL PHENOMENA (551.594)

See also: **Meteorobiol. and atmos. elec.** (Reiter), 12.8–14; **N_2^+ ions in upper Antarctic atmos.** (Weill), 12.8–49; **Lightning discharge on the fuselage of an airplane** (Popov), 12.8–71; **Lightning stroke on an aircraft** (Gasser), 12.8–72; **Report of U. S. Commission 4 on Radio Noise,** 12.8–114; **Sudden ionization anomalies** (Crain, Tamarkin), 12.8–141; **Ionizing agents and the ionosphere** (Krasovskiĭ), 12.8–153; **Electron densities in F region from rocket measurements** (Nisbet, Bowhill), 12.8–155; **Faraday rotation measurements, Fort Churchill** (Prenatt), 12.8–156; **Electromag. energy below ELF range** (Campbell), 12.8–164; **Items,** 12.8–166 to 12.8–169; **Air flow in a large ion chamber** (Faucher), 12.8–335.

12.8–403 551.506.7:551.594.11(545)

Venkiteshwaran, S. P. (*Met. Office, Poona*), **Atmospheric electricity observations in India during the IGY—radiosonde techniques for measuring potential gradient and conductivity** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, *17(12)*, *Special Supplement*, Dec. **1958.** p. 24–32. 11 figs. (incl. photos), 14 refs. **DWB, DLC**—Radiosonde measurements conducted at Poona and at Delhi of the potential gradient and conductivity are discussed. Variations of the potential gradient with height on clear and foggy days are shown in tephigrams. On Oct. 30, 1953 about 10 hr before fog occurred, the gradient was 440 V/meter from 900 to 680 mb. Thickness of clouds is estimable, since in the low and medium clouds the value is about 500 V/meter and in cirrus about 100 V/meter making cirrus about 450 m thick, thundery conditions excepted. The exchange layer at Poona is limited to a height of 3 km above surface.

Koenigsfeld's valve electrometer was adapted for upper air conductivity measurement fluctuations of which are shown in a typical record reproduced atmospheric conductivity above the exchange layer, being primarily a product of small ions from cosmic rays, the ions are a sensitive agent for measuring radioactivity, and are carriers constituting hazard when precipitation may discharge their radioactivity. *Subject Headings:* **1. Radiosonde electrical conductivity soundings 2. Potential gradient vertical distribution 3. India.**—*W.N.*

12.8–404 551.506.3:551.594.13

Muchnik, V. M., **Nekotorye vyvody iz nabliudenii nad atmosfernym elektrichestvom v Kieve, 1949–1953 gg.** [Some conclusions from atmospheric electricity observations made in Kiev in 1949–1953.] *Kiev, Ukraine. Nauchno-Issledovatel'skii Institut, Trudy*, No. 5:229–244, **1956.** 4 figs., 11 tables, 8 refs. **DWB, DLC**—The methods and results of atmospheric electricity observations in Kiev are presented in a series of tables and are discussed at length by the author. They included a study of concentration of light and heavy ions in the air and of air conductivity. Nine pages of various tables illustrate the results of the study. *Subject Headings:* **1. Atmospheric electricity data 2. Kiev, Ukrainian S.S.R.**—*A.M.P.*

12.8–405 551.594.255:551.515.3

Freier, G. D. (*Univ. Minn.*), **The electric field of a large dust devil.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3504, Oct. **1960.** fig., ref. **DLC**—During an eclipse of the sun in the Sahara Desert at Kidal, French West Africa a record was obtained on the electric field associated with a large dust devil. Two negative excursions with a tendency to go positive between suggest a sort of dipole structure for the dust devil with negative charge above (inverted thunderstorm). The electric field for a dipole of strength M, at a height h, and a distance R between the observation point and center of the dipole is given approximately by $E = \frac{-2M}{R^3}\left(1 - \frac{3h^2}{R^2}\right)$. The observation point is on the surface of the earth and the earth is assumed to be conducting plane. After subtracting the average field, the data were analyzed according to this model. If the distance of closest approach is 30 m, the dipole must have a moment $M = 1.7 \times 109$ esu cm and be at a height $h = 21.4$ m in order to give this record. *Subject Headings:* **1. Dust devils 2. Kidal, French West Africa.**—*E.Z.S.*

12.8–406 551.590.21

†Bernard, Pierre, **Le soleil et la météorologie, 1951–1956.** [The sun and meteorology, 1951–1956.] *International Council of Scientific Union, Brussels, Ninth Report of the Study of Solar and Terrestrial Relationships.* Pub. Paris, **1957.** p. 111–120. 73 refs. **DWB**—A review of the literature produced between 1951 and 1956 which concerns the relationship between the sun and various aspects of meteorology with a brief reference to the subject of phenology. Seventy-three references cover the field of interest in detail. *Subject Heading:* **1. Solar-weather relationships.**—*E.Z.S.*

12.8–407 551.590.21:551.510.53

Ooyama, Katsuyuki, **On the vertical propagation of a disturbance through the mesosphere.** New York. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract AF 19(604)-1738, Scientific Report No. 6, Sept. **1958.** 69 p. 11 figs., 2 tables, 14 refs., eqs.—Using a simplified model of the atmosphere, the problem of solar-weather relationship is discussed. It involves the hydrodynamic vertical transfer of a disturbance through the mesosphere, Coriolis parameter being the only cause of wave propagation. The three-dimensional Green's function for a Rossby wave equation in a barotropic atmosphere is treated at some length. Nothing conclusive about anomalous solar-weather relationships is shown here. *Subject Headings:* **1. Solar-weather relationships 2. Mesosphere.**—*W.N.*

PART II. ANNOTATED BIBLIOGRAPHY ON WATER VAPOR CONTENT OF THE ATMOSPHERE ABOVE 50,000 FT.

Compiled by: Elemer Kiss

INTRODUCTION

During the past year a series of special bibliographies have been published in *Meteorological and Geoastrophysical Abstracts* on subjects of great importance to those studying the upper or outer atmosphere of the Earth as well as to those interested in rockets, artificial satellites and their instrumentation. A great deal of information on the conditions in the upper atmosphere have, of course, been obtained from the rocket and satellite flights made in the past decade. Some data have been collected by high level airplane flights or balloons, and a variety of data from indirect methods: optical, acoustical, spectrographic, radio propagation, etc.

The subjects treated in these bibliographies have been:

Vol. XI,	No. 9	Sept. 1960—**Rocket Meteorology**	—201 items
	No. 10	Oct. 1960—**Satellite Meteorology**	—201 items
	No. 11	Nov. 1960—**Airglow**	—142 items
Vol. XII,	No. 1	Jan. 1961—**Aurora**	—252 items
	No. 2	Feb. 1961—**Auroral Physics**	—184 items
	No. 4	April 1961—**Upper Atmospheric Structure** (Pressure, Temperature & Density) **30–80 km**	—210 items
	No. 5	May 1961—**100–250 km**	—179 items
	No. 6	June 1961—**>250 km**	— 96 items

Whereas a great deal of increasingly accurate data have been obtained on the pressure, temperature, density and ionization of the upper atmosphere, reliable data on water vapor concentration (humidity, mixing ratio or vapor pressure) is practically nil, and whatever is available is mostly confined to the high flying levels of airplanes or sounding balloons. Even in the latter case radiosonde data on moisture content above the tropopause (ca 30–40 thousand ft) are woefully inaccurate except in a few notable instances.

By the same token, whatever reliable data are available become increasingly valuable as improvement in instruments, techniques and carriers permit a larger amount of data to be obtained from a wider variety of places and from higher altitudes. For time variations are extremely important in geophysical studies and time variations can only be computed from past data whose accuracy is comparable with current and future data.

In view of the above, we have tried in every way possible to obtain references to articles containing data obtained by direct or indirect methods, on water vapor in the stratosphere and outer atmosphere. Obviously, we have missed a number of good sources and would be pleased to have such omissions called to our attention. We have not attempted to cover thoroughly the rich literature on instruments and on methods, especially indirect methods such as spectroscopy which give total water vapor in a column of air, valuable as these methods are and will be now that elaborate equipment is being lifted to the outer reaches of the atmosphere.

A few articles on noctilucent clouds have been included since a number of authors have predicated their calculations on the supposition that these clouds consist of water vapor (or ice particles) rather than dust clouds. The vast literature on noctilucent clouds has, however, been reserved for a future bibliography. Similarly, the great number of articles on exhaust condensation trails at high altitudes has been omitted since the moisture values are artificially influenced by combustion products of jet motors. Wing-tip contrails, however, are more indicative of ambient moisture content. A bibliography on condensation trails was published in Vol. 2, No. 9 (Sept. 1951) of *Meteorological Abstracts and Bibliography*, and dozens of additional references will be found in the annual Subject Indexes of Vol. 3–10, and in the monthly indexes of Vol. 11 and 12.

The outline below shows the range of subject matter included in this limited compilation. Bibliographies in the 3 subsequent issues will lead the reader to a little analogous information on the moisture of the atmospheres of (1) the terrestrial, 2) the Jovian planets, and 3) the Moon, respectively.

SUBJECT OUTLINE

COMPREHENSIVE WORKS

Textbooks and Handbooks

Humphreys (1940), 12H–16
Goody (1954), 12H–60
Penman (1956), 12H–74
Khrgian (1958), 12H–85
Usol'tsev (1959), 12H–92
Handbook of Geophysics (1960), 12H–98
Ratcliffe (1960), 12H–107

Monographs

Bannon et al (1952), 12H–47
Hackforth (1960), 12H–97

Major Reports and Articles

Crain (1947), 12H–24
Denver Univ. (1952), 12H–48
Kaplan (1955), 12H–66
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1920

12H–1 551.510.53:551.510.41(420)

Chapman, S. and Milne, E. A., **The composition, ionisation and viscosity of the atmosphere at great heights.** *Royal Meteorological Society, Quarterly Journal*, 46:357–398, **1920.** 5 figs., 29 tables, 41 foot-refs., 17 eqs. **DLC**—Features of the atmosphere at great heights are described. Tables show the partial densities of various atmospheric constituents at various heights. It is pointed out that effective kinematical viscosity of the atmosphere increases very rapidly at great heights owing to the decrease in density. In regard to water vapor, reliable determination of humidity of the atmosphere above the limits of the troposphere is not available, but the relative humidity is always found to be small. At −54°C (the mean temperature of the stratosphere over England) the saturated vapor pressure of ice is about 0.019 mm, and hence the total pressure at the base of stratosphere being roughly 200 mb, the proportion of water vapor cannot exceed 1 part in 8000 volume. *Subject Headings:* **1. Atmospheric composition 2. Ionization 3. Viscosity 4. England.**—*A.H.K.*

1923

12H–2 551.510.53:523.5:551.571.7

Lindemann, F. A. and Dobson, G. M. B., **A theory of meteors, and the density and temperature of the outer atmosphere to which it leads.** *Royal Society of London, Proceedings, Ser. A*, 102(A717): 411–437, Jan. **1923.** 6 figs., 4 eqs. **DLC** (Q41.L7)—The purpose of this note is to examine how much information about conditions at great heights may be gained from a study of meteors. Existing

bservations enable us to say with considerable certainty that the density at heights above 65 km s very much higher than is commonly supposed and that the temperature must increase from its alue of something like 220° abs. at heights between 12 and 50 km, to something like 300° abs. at hese heights. The possible explanations of observed high temperature are examined. In the tratosphere where there is a considerable amount of CO_2 and H_2O and some 20 per cent of the earth's adiation is absorbed, the mean temperature will approach the temperature proper to these two gases, .e. it will be less than 236° since the transparent gases are ineffective as radiators. Above 60 km the CO_2 has practically disappeared and H_2O is reduced to 1/100 of its amount at 10 km. Here, therefore, these gases only transmute some 0.2 per cent of the total radiation and are almost as ineffective as N_2 or H_2. The effects of O_3 are discussed in considerable detail. *Subject Headings:* **1. Meteor bservation of upper atmosphere 2. Upper atmosphere structure 3. Water vapor stratification.** —*E.Z.S.*

1928

12H–3 551.524:551.510.41:546.214:551.571.2

Gowan, Edward H., **The effects of ozone on the temperature of the upper atmosphere, Pt. 1.** *Royal Society of London, Proceedings, Ser. A*, 120(A786):655–669, Oct. **1928.** fig., table, foot-refs., qs. **Pt. 2.** *Ibid.*, 128(A808):531–550, Aug. **1930.** 6 figs., foot-refs., eqs. **DLC** (Q41.L7)—The urpose of Pt. 1 was to consider the radiative equilibrium of the upper part of the atmosphere, taking nto account the effects, with selective absorption, of water vapor and ozone. It is shown that these ead to a region of high temperature in the neighborhood of, and above 60 km. It is assumed that vater vapor and ozone are the principal gases in the upper atmosphere which absorb solar and terestrial energy. The curves obtained from the calculations are discussed in considerable detail. In adiative equilibrium the temperature of the air is determined by equaling the amount of energy mitted to the amount absorbed, and these amounts depend upon the amounts of water vapor and ozone present. The method employed was to assume a distribution of temperature, and since the mount of water vapor depends upon temperature, to determine the proportion of water vapor at arious heights. In Pt. 2, the work is carried much further, various changes in fundamental assumptions are tested, and the effects of some varying physical conditions are calculated. Three assumptions were established in connection with the water vapor distribution: (a) assuming that there is no onnection in the stratosphere, the gases at all heights are in gravitational equilibrium with their wn partial pressures (Dalton's Law), (b) if there is sufficient convection in the stratosphere to naintain constant composition, the water vapor is in a fixed proportion to the total pressure above 1 km, (c) constant composition as in "b" up to about 70 km, and above that the distribution is in ccordance with Dalton's Law. Attached diagrams show the data derived from the above assumptions. *Subject Headings:* **1. Temperature-ozone amount relationship 2. Water vapor distribution.** —*E.Z.S. and E.K.*

1933

12H–4 551.593.652:551.593.653

Humphreys, W. J. (*Weather Bureau, Washington*), **Nacreous and noctilucent clouds.** *Monthly Weather Review*, Wash., D. C., 61(8):228–29, Aug. **1933.** 2 figs. **DLC** (QC983.A2)—Both types f the stratospheric clouds had been observed long before STÖRMER. Nevertheless their origin is till in doubt. The author in his tentative hypothesis assumes that they are produced by the ondensation of water vapor just as are all the clouds of the lower atmosphere. Calculations show hat the pressure should be constant at 20 km, and below this level the air of the stratosphere must low from the lower to higher latitudes. From various assumptions a temperature of 205°K was alculated to be the saturation point at the height of 25 km, the level of the mother-of-pearl clouds. upposing a change in temperature with height, the saturation over ice (ice because the noctilucent louds do not show iridescence) could occur and clouds begin to form at the height of 80–83 km and t a temperature of about 160°K. Water vapor at every level was assumed to be 1/4000 of all gases resent. *Subject Headings:* **1. Nacreous clouds 2. Noctilucent clouds.**—*E.K.*

12H–5 551.501:551.594.51:535.33(481)

Vegard, L., **Investigations of the auroral spectrum based on observations from the auroral bservatory, Tromsø.** *Geofysiske Publikasjoner*, Oslo, 10(4):5–61, **1933.** 17+4 figs., 23 tables, oot-refs., 5 eqs. **DLC** (QC801.N67)—A detailed account of the investigations of the auroral spectrum at Tromsø. The plan and equipment which are of special interest in connection with the pectral work, observations and results are discussed. The author suggests that if hydrogen in large uantities came into the auroral region, it would probably unite with activated oxygen, to form water apor, which might condense and form a haze in clouds, as it sinks downwards. This way we may xplain the luminous night clouds. According to measurements undertaken by JESSE, STÖRMER nd others, this condensation should take place at a height of about 80 km. *Subject Headings:*

1. Auroral spectrum measurements 2. Water content of noctilucent clouds 3. Tromsø, Norway. —*E.K.*

1934

12H–6 551.510.53:551.506:551.571.7

Experiments in the stratosphere. *Nature*, London, 133(3349):15–16, Jan. 6, **1934.** **DLC**—A brief note about a proposed balloon flight which aims to reach higher altitudes than 61,000 ft, claimed by PROKOFIEV and his associates in the U.S.S.R. Among other experimental results from the Russian source are the finding of atmospheric composition to be the same at the lower pressure reached as on the ground, and that relative humidity fell from 92% at ground level to 42% at the limit of the stratosphere. *Subject Headings:* **1. Upper atmosphere research 2. Upper atmosphere composition 3. Humidity measurements.**—*E.K.*

12H–7 551.510.53:551.593.652(712.13)

†Vestine, E. H., **Noctilucent clouds.** *Royal Astronomical Society of Canada, Journal*, 28(6):249–272, July/Aug. **1934.** 9 figs., 3 tables, 28 refs., 7 eqs. **DLC** (QB1.R485)—The observations and photographs of noctilucent clouds taken at Meanook, Alberta (Lat. 54°37′N, Long. 113°20′W), on the night of July 20–21, 1933, are given, the observation being possibly the first recorded in America. A method of determining their least possible heights from single station photographs is developed and these heights deduced for the clouds observed at Meanook. A summary of 290 previous observations taken on 187 evenings for 1885–1933 is given in brief tabular form. A statistical study of the distribution of evenings of occurrence indicates a close conformity to a normal error law, the maximum frequency appearing about 10 days after the summer solstice, at which time the clouds appear to be most brilliant. The times of yearly preponderance of striking cosmic phenomena, explosive volcanic eruptions and relative sunspots have been compared with the yearly frequencies of noctilucent clouds. The general characteristics of the clouds during the past half century and their probable origin are discussed. Some observers consider them to be due to the presence of gases erupted by volcanic explosions, while others found that they are composed of ice crystals. The author suggests these clouds originate from meteors. *Subject Headings:* **1. Upper atmosphere phenomena 2. Noctilucent clouds 3. Meanook, Alberta, Canada.**—*Author's abstract and E.K.*

1935

12H–8 551.510.41:551.510.53

Lepape, Adolphe and Colange, Georges, **Sur la présence de la vapeur d'eau et de l'anhydride carbonique dans l'air de la stratosphère.** [The presence of water vapor and carbon dioxide in the air of the stratosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 200:2108–2110, **1935.** table, 10 refs. **DLC**—Analyses of upper air samples from heights of 9–16 km. gave 0.03–0.13 percent of carbon dioxide and 0.1 to 0.4 mm water vapor content. (*Same item as* 3B–173, Feb. 1952, *Met. Abs.*) *Subject Headings:* **1. Carbon dioxide 2. Water vapor.**

1936

12H–9 551.510.534:551.571.71

Chapman, Sydney, **Some notes on the theory of atmospheric ozone.** *Royal Meteorological Society, Quarterly Journal*, 62(Supplement):67–68, **1936.** 3 refs. **DLC**—In relation to existing theories, WEGENER's suggestion that ozone formation is due primarily to dissociation of H_2O instead of O_2 is refuted. The amount of water vapor present in the stratosphere is briefly considered. The molecular diffusion of ozone due to concentration, pressure and thermal gradients is very small at least up to 40 km. The ozone is carried into the troposphere from the levels at which it has been formed. *Subject Headings:* **1. Ozone theories 2. Water vapor dissociation.**—*A.H.K.*

12H–10 551.510.53

†Haurwitz, Bernard, **The physical state of the upper atmosphere.** *Royal Astronomical Society of Canada, Journal*, 30(8–10):315–330; 349–366; 397–415, Oct.–Dec. **1936**; 31(1–2):19–42; 77–92, Jan.–Feb. **1937.** 30 figs., 11 tables, 121 refs., 48 eqs. **DLC**—Reprinted as separate. University of Toronto Press, **1937.** 96 p. Also with supplementary material by Royal Astronomical Society of Canada, Oct. **1941. GB-MO**—In this review of knowledge concerning the upper atmosphere, the occurrence of clouds in the stratosphere is mentioned. Stratospheric clouds at heights of 22 to 30 km—the mother-of-pearl clouds—according to the present state of information consist of condensation products of water vapor. The noctilucent clouds, observed at heights of about 80 km, seem to be of different origin. They probably consist of meteoric dust which enters the atmosphere at certain times and which is high enough to be illuminated by the sun even during the night.

(*Same item as* 4F–16, June 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Nacreous clouds 3. Noctilucent clouds.**—*E.K.*

12H–11 551.510.53:536:551.593.652

Jaumotte, J., **Transformations thermodynamiques de la stratosphère et nuages nacrés.** [Thermodynamic transformations of the stratosphere and nacreous clouds.] *Belgium. Institut Royal Météorologique, Mémoires*, v. 5, **1936.** 43+p. 22 figs., tables, refs., 13 eqs. **DWB**—Numerous graphs of temperature soundings (Uccle and a few from other places in Europe) are presented and analyzed synoptically and dynamically to show the cause of the peculiar type of stratospheric structure which they illustrate. In every case the temperature continues to drop after the balloon has risen a few kilometers above a sharp, moderately low tropopause, reaching a minimum at around 18 or 20 km (usually the top of the sounding). The peculiar structure is explained on the grounds of tropical air of the high tropopause (15 to 19 km) moving N in advance of a deep cyclone or trough aloft and being modified considerably by dynamic transformations which naturally occur. Potential temperature/height diagrams help identify the source. Moisture from the tropics is involved and causes nacreous clouds in Arctic when the very cold inversions of tropic air occur. Moisture penetrates even into the stratosphere (i.e. to 24 km) by diffusion, contrary to the theory of GOLD (*Geophysical Mem.*, No. 5) that the tropopause is a "lid" for upward movement of water vapor. Moisture measurements are almost impossible in the stratosphere, except where clouds exist. The present paper is the first to recognize the dual nature of the tropopause in polar and tropical regions and the possibility of their existing simultaneously (superimposed) at the same station. (*Same item as* 5D–84, April 1954, *Met. Abs.*) *Subject Headings:* **1. Tropopause dynamics 2. Tropical tropopause 3. Polar tropopause 4. Nacreous clouds.**—*M.R.*

12H–12 551.524.7:551.510.535:551.571.72

Martyn, D. F. and Pulley, O. O., **The temperatures and constituents of the upper atmosphere.** *Royal Society of London, Proceedings, Ser. A*, 154(882):455–486, April **1936.** 5 figs., foot-refs., 24 eqs. **DLC** (Q41.L7)—This paper describes the results and conclusions obtained from a series of experiments made during a study of the constituents of the upper atmosphere. Conditions in the F region are described. The high temperatures in the F region show a correlation with the barometric conditions at the ground, the air between the E and F regions being hotter over cyclones and colder over anticyclones. It appears that these variations can be brought about only by variation of the water vapor or ozone content of the upper atmosphere in these regions. An increase of water vapor would produce a lower equilibrium temperature, while an increase of ozone would produce a higher equilibrium temperature. On the strength of the evidence adduced we can perhaps do no more than say that the facts of the high and variable temperatures of the upper atmosphere receive a natural explanation if a second upper region of ozone exists at these levels, the concentrations of this upper region varying from day to day in the same manner as does the lower. *Subject Headings:* **1. Upper atmosphere temperatures 2. Water vapor distribution 3. E-layer 4. F-layer.**—*E.Z.S.*

1938

12H–13 551.501.771:551.510.53:551.571.7

Brunt, D. and Kapur, A. K., **The amount of water vapor in the stratosphere and upper troposphere.** *Royal Meteorological Society, Quarterly Journal*, 64.510–515, **1938.** fig., table, 4 refs. [**Comment by**] Edward Kidson, *Ibid.*, 65(281):454–455, July **1939.** ref. [**Reply by**] D. Brunt, *Ibid.*, 65(282):503–504, Oct. **1939.** 3 refs. **DLC**—A formula has been derived to calculate total water vapor content of the atmosphere. This formula shows that the total is 0.62 times the amount which would be derived on the basis of Dalton's law. The actual amount in the stratosphere above the tropics is found to be very small, equivalent to about 0.01 mm of precipitable water. Results of computations to find out the level above which 0.3 mm of precipitable water will be found are discussed. Reference is made to the humidity mixing ratio, which is considered constant everywhere above the troposphere. EDWARD KIDSON in his comment reports that the relative values of the mixing ratio at the tropopause were computed using the figures given by BRUNT for the amount of water vapor in the stratosphere in different latitudes and pressures at the tropopause derived from WAGNER'S table. The resulting figures give a fairly rapid variation of mixing ratio with latitude. The value at the equator in summer is approximately one fortieth of that at the pole. It seems that the mixing ratio must vary in both horizontal and vertical directions in the stratosphere. There are numerous reasons for believing that temperatures in the highest layers of the atmosphere are very high. A certain amount of dissociation of water molecules must be brought about at these heights by solar radiations. The hydrogen thus released would escape rather rapidly from the atmosphere. The depletion of the water content of the stratosphere thus resulting may be of important dimensions. In his reply BRUNT points out that if there is saturation at the tropopause, the density of water vapor is a function of temperature alone. The mixing ratio is inversely proportional to the total pressure,

and if the same mixing ratio holds up to the top of the atmosphere, the total amount of water vapor must come out to be independent of pressure at the tropopause. The independence is of course purely functional; indirectly, pressure must have an effect, since a high tropopause, i.e., one at low pressure, will usually have a low temperature. *Subject Headings:* **1. Water vapor measurements 2. Mixing ratio.**—*A.H.K. and E.Z.S.*

1939

12H–14 551.510.41:551.510.53

Paneth, Fritz Adolph, **Composition of the upper atmosphere. Direct chemical investigation.** *Royal Meteorological Society, Quarterly Journal*, 65(281):304–310, July **1939.** 2 figs., 4 tables. **DLC**—The author does not find deviation in the composition of air up to about 20 km, but above this height the helium content is greater and the oxygen content smaller. It is concluded that a diffusive separation of heavy and light gases begins at 20 km. The application of chemical methods to the analysis of gases such as water vapor, radon and ozone is discussed. Attempts to determine water vapor concentration include: a) the use of hair hygrometer, which does not give reliable humidity figures of stratospheric air, b) the application of the physiochemical methods which might yield exact water vapor data. *Subject Headings:* **1. Upper atmosphere composition 2. Diffusion in upper atmosphere 3. Water vapor measurement techniques.**—*E.K.*

1940

12H–15 551.521.3:551.571.7:533.4

†Brunt David, **Radiation in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 66(Supplement):34–40, **1940.** table, 17 refs., eq. **DLC**—The aim of this paper is to review the present situation as regards the explanation of the phenomena of absorption and radiation in the Earth's atmosphere. The discussions are presented under the following headings: the absorption spectrum of water vapor; radiative transfer in the atmosphere; downward long-wave radiation from the atmosphere; and conditions in the stratosphere. Some previous views of the author are revised in the light of the most recent research on the spectrum of water vapor. In particular the work of Randall, Dennison, Ginsburg and Weber (1937) made such revision necessary. It was assumed that a layer of air containing 0.3 mm of precipitable water would act effectively as a black body. The depth of such a layer was shown to be 1.39 T/e m, where T is the absolute temperature and e is the vapor pressure in the atmosphere, measured in mbs. If we replace Hettner's coefficients of absorption by those derived by Elsasser, the depth of such a layer must be increased in inverse proportion to the assumed coefficient of absorption. It thus appears that the depth must be increased by a factor of the order of 20 to 30, and in consequence the value of K_R would appear to be perhaps 30 times greater than was deduced on the basis of Hettner's work, and so may be of the order of 10^4. In relation to conditions in the stratosphere it is noted that since the absorption in a layer of unit water-vapor content is proportional to $p^{\frac{1}{2}}T^{-\frac{1}{2}}$ (Elsasser, 1938), where p is the total pressure, and T is the absolute temperature, it follows that the effective coefficients of absorption in the stratosphere must be mainly dependent on the total pressure, and so are of the order of one-half of the values which are appropriate at the surface. The amount of water vapor radiation originating in the stratosphere must be much less than the total black body radiation within the appropriate range of wave lengths, and it is difficult to see how radiation and absorption can exert in the stratosphere the controlling influence which has hitherto been attributed to them. *Subject Headings:* **1. Atmospheric radiation 2. Absorption by water vapor 3. Water vapor spectroscopy.**—*E.Z.S.*

12H–16 551.506:551.571

Humphreys, W. J., **Physics of the air.** 3rd ed. New York, McGraw-Hill, **1940.** 676 p. 225 figs., tables. **DLC, DWB—Ch. 5, "Composition, pressure, and density"** (p. 67–82) treats the water vapor content of the atmosphere, taking the average amount of water vapor to be the equivalent of a layer of water over the entire earth 2.54 cm deep. The mass W of water vapor is given by the equation

$$W = 2.54 \times 51 \times 10^{17} \text{ grams}$$

Table presenting the mass of atmosphere and its constituents shows the total of water vapor $130{,}000 \times 10^{11}$ kilograms. *Subject Headings:* **1. Water vapor amount in atmosphere 2. Water vapor measurements 3. Textbooks.**—*E.K.*

12H–17 551.593.653

Vegard, L., **Continued investigations on the auroral luminescence and the upper atmosphere.** *Geofysiske Publikasjoner*, Oslo, 12(14), 24 p, **1940.** 4 figs., 11 tables, 21 eqs., 34 refs. **DWB**—In Sec. 2 of the paper the author attempts to explain the luminous night clouds, situated at an altitude

about 80 km. His previous explanation, according to which these clouds are due to showers of hydrogen coming from space is supported with the suggestion that the condensation process is facilitated by the presence of nuclei. These nuclei might originate from sodium, and possibly the sodium or sodium oxide forms the effective nuclei for the condensation of water vapor which results from the hydrogen showers. The sodium oxide dissolving in the water would reduce the vapor pressure of the condensed particles. The reduction of vapor pressure explains the fact that the luminous night clouds are situated at an altitude of about 80 km. *Subject Headings:* **1. Noctilucent clouds 2. Nucleation theories 3. Condensation of water vapor.**—*E.K.*

1943

12H–18 551.510.53:523.5:551.593.653

Whipple, Fred L. (*Harvard College Observatory, Cambridge, Mass.*), **Meteors and the Earth's upper atmosphere.** *Reviews of Modern Physics*, New York, 15(4):246–264, Oct. **1943.** 5 figs., 10 tables. **DLC** (QC1.R4)—The structure and temperature of the upper atmosphere from 40 to 110 km are discussed. The author gives a temperature maximum of about 375°K near the 60 km level, a rapid drop to 250°K near 80 km, and a constant or slowly rising temperature at heights to about 110 km. These calculations support HUMPHREYS' suggestions that noctilucent clouds may be composed of ice crystals, which can be formed over ice at a temperature much below the value estimated at the 60 km level. Noctilucent clouds have been observed at about 82 km. This evidence for a low or minimum value of the atmospheric temperature near 82 km is less conclusive, than the general evidence for a temperature decrease above 60 km, but encourages confidence in the theoretical result. *Subject Headings:* **1. Meteor observation of the upper atmosphere 2. Noctilucent cloud data 3. Ice crystal content of noctilucent clouds.**—*E.K.*

1944

12H–19 551.501.771:551.508.71

Glückauf, E. (*Univ. Scien. Lab., Durham*), **Notes on upper air hygrometry, Pt. 1, Calculation of the relative humidity from hair hygrometer readings, during balloon ascents.** *Royal Meteorological Society, Quarterly Journal*, 70(306):293–301, Oct. **1944.** 3 figs., 5 tables, 11 refs., 13 eqs. **Pt. 2, On the humidity in the stratosphere.** *Ibid.*, 71(307/308):110–114, Jan./April **1945.** 3 tables, 5 refs. **DLC** (QC851.R8)—In Pt. 1, a method is described for calculating the relative humidity from data obtainable from balloon hair hygrograph records under conditions in which the hair does not reach equilibrium with its surroundings. Based on and checked by means of laboratory measurements, the method gives consistent results if applied to the Dines meteorograph. In Pt. 2, an attempt is made to obtain some idea of the humidities occurring in the stratosphere by means of the method described in Pt. 1. It happens very frequently that the method cannot be applied because sometimes the hair hygrometer for reasons unknown freezes up, and then remains almost completely immobile. The meteorograph data of April, and Sept. 1939 for which almost daily ascents were available, have been chosen for this purpose as fortunately they have been practically free of the undesirable feature. The heights were from 7 to 17 km. When high humidities were found in the stratosphere according to the author this fact is not a proof of vertical mixing, but may be due to advection of polar stratospheric air. *Subject Headings:* **1. Upper air humidity 2. Hair hygrometer.**—*E.K.*

1945

12H–20 551.571.4:535.34:551.571.7

Foster, Norman B. and Foskett, Laurence W. (*both, U. S. Weather Bureau, Wash., D. C.*), **A spectrometer for the determination of the water vapor in a vertical column of the atmosphere.** *Optical Society of America, Journal*, 35(9):601–610, September **1945.** 8 figs., table, 11 refs. **DLC**—A simple photoelectric spectrophotometer is described, developed to determine the precipitable water in a vertical column of the atmosphere. A transmission replica grating is used as the dispersing element and an infrared sensitive photo tube as the energy receiver. The photo tube current is amplified by a negative feed-back d.c. amplifier and is read either by means of a 500 microampere ammeter or recorded by a high speed potentiometer recorder. Measurements were obtained by comparing the radiant flux in the 0.94μ water vapor adsorption band with that at 1.01μ where no absorption occurs. A single-mirror heliostat is utilized to keep the spectrophotometer focussed on the sun. An approximative calibration was obtained by plotting the spectrophotometer ratios against the total precipitable water values in a vertical column of the atmosphere as calculated from radiosonde moisture data. Table I gives a series of observations carried out in Washington, D. C. during the Spring, Summer and Fall of 1944 with appropriate headings and data for reduction of water vapor observations. *Subject Headings:* **1. Vertical water vapor distribution 2. Spectroscopic water vapor measurement techniques 3. Spectrophotometer.**—*Authors' abstract.*

1946

12H–21 551.524.7:551.521

Dobson, G. M. B. (F.R.S.), **The temperature of the upper atmosphere, Pt. 1, General thermal characteristics of the atmosphere.** *Weather*, London, 1(2):58–59, June **1946.** fig. **Pt. 2, Solar and terrestrial radiation.** *Ibid.*, 1(3):73–77, July **1946.** fig., plate. **Pt. 3, Reasons for the observed thermal structure of the atmosphere.** *Ibid.*, 1(4):115–119, Aug. **1946.** fig. **DLC** (QC851.W4)—Part I contains an account of the thermal characteristics of the atmosphere, and particularly of its three lowest regions—the troposphere, stratosphere and the upper warm region. The variation of temperature with height is discussed. Faint clouds are seen well after sunset on very rare occasions. These clouds are illuminated by sunlight. The height is assumed to be 85 km (260,000 ft). It is not certain that they are formed of water but on the assumption that they are water or ice particles, it has been suggested that the temperature must have fallen at this height to quite low values to allow the clouds to form. Part 2 contains a discussion of solar and terrestrial radiation. Following discussion of oxygen and ozone both water vapor and carbon dioxide are considered. Absorption by water vapor is particularly strong and covers a wide region of the infra-red spectrum. It is pointed out that while water vapor is very abundant in the lower troposphere, it decreases rather rapidly with height and it has recently been shown that the absorption by water vapor in the stratosphere must be small. Methods and instruments used to measure water vapor content in air are noted and a photograph of a simple instrument is included. It is added that some of the infra-red wavelengths are not absorbed by either water vapor or carbon dioxide, and in particular there is a region about 10 M where water vapor is practically transparent. Part 3 contains suggestions which might explain why the atmosphere is divided into three regions. Since we do not know the amount of ozone or carbon dioxide, and still less that of water vapor, in the upper warm region we cannot account for the existence of the upper warm region. Our knowledge of the amount of water vapor in the stratosphere is derived from measurements made on about 16 aeroplane flights, and these only penetrated a small distance. The amount of water vapor there appears to be small indeed. Finally the origin of the troposphere is considered. *Subject Headings:* **1. Upper air temperature variations 2. Noctilucent clouds 3. Infrared absorption of water vapor 4. Water vapor measurement techniques.**—*E.Z.S.*

12H–22 551.510.53:551.571(420)

Dobson, G. M. B.; Brewer, A. W. and Cwilong, B. M., **Meteorology of the lower stratosphere.** *Royal Society of London, Proceedings, Ser. A*, 185(1001):144–175, Feb. 12, **1946.** 18 figs., 15 refs. **DLC**—In this monumental work on water vapor, ozone and CO_2 in the upper atmosphere, their influence on radiation balance and hence on temperature and height of tropopause, etc., the authors present numerous charts and graphs to show the quantitative relationship of the elements with height, time, and synoptic conditions. Many individual soundings are shown as well as mean conditions over England. The relative importance of various gases is considered and, finally, the three questions posed by SIMPSON (1928) regarding the tropopause are tentatively answered on the basis of ratio of H_2O = vapor to O_3 and turbulent mixing. It is assumed that the distribution of water vapor in the stratosphere is influenced by the air at the tropopause which is saturated, or nearly saturated. A slow churning of the air in the stratosphere would mix the air of upper stratosphere with the air immediately above the tropopause. It was observed that on entering the stratosphere the frost-point fell very rapidly. A diagram showing frost-point versus height, indicates that the stratospheric air is very dry. (*Same item as* 5D–129, April 1954, *Met. Abs.*) *Subject Headings:* **1. Stratospheric composition 2. Water vapor in stratosphere 3. Ozone 4. Radiation balance 5. England.**—*M.R. and E.K.*

12H–23 551.510.53

Gutenberg, Beno, **Physical properties of the atmosphere up to 100 km.** *Journal of Meteorology*, Boston, 3(2):27–30, June **1946.** 5 figs., 26 refs. **DWB**—Discusses temperature, pressure, density and other physical properties of the stratosphere. Diagram shows variation with height of approximate characteristic values of wind speed and direction, and velocity of sound up to 80 km. The absorption of the solar radiation by water vapor between 40–60 km is assumed rather certain. (*Same item as* 4F–31, June 1953, *Met. Abs.*) *Subject Headings:* **1. Stratosphere 2. Upper air wind data 3. Absorption by water vapor.**—*G.J.E.*

1947

12H–24 551.510.41:537.226

Crain, Cullen M., **Dielectric constants of water vapor and atmospheric air at a frequency of 9340 megacycles.** Texas. University. Electrical Engineering Research Laboratory, Contract N6onr-266, Task Order 1, Report No. 9, Sept. 1, **1947.** 15 p. 8 figs., table, 6 refs. **DWB**—"The dielectric constant of dry air, oxygen, and water vapor have been measured at a frequency of 9340 megacycles

sing the beam frequency method. The frequency of one stabilized oscillator is varied by introducing as into a cavity resonator. The output of this oscillator is mixed with the output of another tabilized oscillator and the resulting beam frequency is measured." The apparatus and procedure re described. Detailed schematic drawings showing the instruments are presented and results of he measurements offered. (*Same item as* 4.9–67, Sept. 1953, *Met. Abs.*) *Subject Headings:* **1. Atmospheric composition 2. Water vapor 3. Dielectric constants.**—*G.T.*

12H–25 551.507.362.1:551.510.53:551.506:551.571.7

†Hulburt, E. O. (*Naval Research Lab., Wash., D. C.*), **The upper atmosphere of the Earth.** *Optical Society of America, Journal*, 37(6):405–415, June **1947.** 13 figs., 26 refs. **DLC**—A description f present knowledge of the atmosphere up to the ionosphere and of the contributions which the V-2 ocket experiments have made to this knowledge. Tentative tables of the upper atmosphere and ata from the rocket experiments are included. In relation to discussions on the composition and emperature of the atmosphere references are made to the presence of water vapor and ozone. It is ointed out that neither water vapor nor ozone are constant in amount. The total amount of water apor in a 1 cm² vertical column of air cannot exceed about 2.6 g. Four fields of experimentation hich have led to deductions about upper air temperatures and pressures, sound wave propagation, tmospheric tides, twilight sky brightness and meteors, are discussed. *Subject Headings:* **1. Rocket xploration of the upper atmosphere 2. Water vapor measurements.**—*E.Z.S.*

12H–26 551.521.1:551.510.53:551.508.71

Sheppard, P. A. (*Imperial College of Science and Technology, London*), **Radiation in the stratosphere and troposphere.** *Science Progress*, London, 35(137):87–101, Jan. **1947.** 3 tables. **DLC**—n Ch. 2, the amount and distribution of water vapor in the stratosphere are discussed. The design nd use of an aircraft frost-point hygrometer by Dobson, Brewer and Cwilong is described. he author concludes that if there is a constant mixing ratio of water vapor to dry air throughout he body of the stratosphere with frost points as observed in its lower region, the amount of precipiable water in the stratosphere is of the order of 10^{-3} to 10^{-4} cm only. Reference is made to techiques for measurement of water vapor by observing the absorption of solar radiation in the near nfrared. *Subject Headings:* **1. Water vapor distribution 2. Water vapor in stratosphere 3. Dobson, rewer and Cwilong frost-point hygrometer.**—*E.K.*

1948

12H–27 551.508.71:551.571

Brewer, A. W., Cwilong, B. M. and Dobson, G. M. B., **Measurement of absolute humidity in xtremely dry air.** *Physical Society, London, Proceedings*, 60(337):52–70, Jan. 1, **1948.** 6 figs., tables, 11 refs. **DWB, DLC**—The method of measuring water vapor content of air down to a oncentration of 0.4 mg per cubic meter, a dew point hygrometer developed to meet need for humidity easurements within 1 accuracy to frost points of −90°C to be used in upper air soundings is escribed. The history of instrumentation, deposition of water vapor at very low temperatures, escription and use of hygrometers, laboratory tests of the instrument are discussed. When flights ere made into the stratosphere the relative humidity was found of the order of 1 or 2 per cent. Below −90°C it is not possible to operate a frost point hygrometer because the deposit is in the form of n invisible glassy layer, but the instrument gives correct results at temperatures close to this limit. (*Same item as* 2–36, Feb. 1950, *Met. Abs.*) *Subject Headings:* **1. Humidity measurement techniques Hygrometers.**

12H–28 551.510.53:551.571.7:551.593.652

Chapman, S., **The stratosphere.** *Weather*, London, 3(1):2–9, Jan. **1948.** illus. **DLC** QC851.W4)—The extremely cold air of the stratosphere can at most hold only a minute proportion water vapor condensation; but even this small amount has an important influence on the temerature. Dobson and Brewer found that stratospheric air is extremely dry. They suggested at the only way it could become so dry was by coming from the exceptionally cold equatorial ratosphere. The occasional presence of the mother-of-pearl clouds at 14–18 mile altitudes is scussed. It seems they consist of extremely small droplets of supercooled water. *Subject Headgs:* **1. Water vapor in stratosphere 2. Nacreous clouds.**—*E.K.*

12H–29 551.593.652:551.576.1

Störmer, Carl (*Inst. for Theoretical Astrophysics, Blindern, Norway*), **Mother-of-pearl clouds.** *eather*, London, 3(1):13–18, Jan. **1948.** 2 figs., 4 photos., table, 13 refs. **DLC** (QC851.W4)—report containing the results of measurements on mother-of-pearl clouds between 1926 and 1946. om registering balloons, temperature measurements at the level of these clouds on two different casions were −76°C (22 km) and −83°C (23 km). The colors of the clouds are attributed to

refraction and reflection in a homogeneous cloud of water particles. It is pointed out that the formation of droplets is energetically easier than the formation of ice crystals so long as the temperature is above −70°C and small droplets of chemically pure water may be supercooled to this temperature. Water and ice may exist in a stable association at temperatures down to −30° to −35°C, and in a narrow range around −70°C. The mother-of-pearl clouds presumably exist in the latter range. *Subject Headings:* **1. Nacreous clouds 2. Water content of clouds.**—*E.Z.S.*

1949

12H–30 551.501.771:551.571.7:551.508.71(776)

Barrett, Earl W.; Herndon, Lee R., Jr. and Carter, Howard J., **A preliminary note on the measurement of water-vapor content in the middle stratosphere.** *Journal of Meteorology*, Boston, 6(5):367–368, Oct. **1949.** 2 figs., 2 refs. **DLC**—A preliminary note concerning a detailed balloon sounding of the atmosphere to a height of over 30 km. Continuous measurements of the dew-point temperature was the outstanding feature. The complete sounding instrument consists of an electronic dew-point hygrometer, air temperature thermocouple designed to minimize lag and radiation error, hypsometer for pressure measurement, thermocouple voltage amplifier, reference ice bath, standard cell for calibration, sequence switch, radio telemetering unit, and battery power supply. The balloon was launched at 0633 CST on July 1, 1949 at Camp Ripley, Minn., about 14 hours after the passage of a weak cold front followed by an extremely dry modified mp air mass. The results of the soundings are shown on graphs. Perhaps the most striking feature of this sounding is the amount of stratification of both temperature and moisture which is observable. It is suggested that, at least for the air mass in which this sounding was made, the vertical mixing plays only a very minor part in establishing the distribution of water vapor and that one must look to advective and/or lateral mixing processes to account for the distribution. *Subject Headings:* **1. Dew point hygrometer 2. Water vapor profiles 3. Camp Ripley, Minn.**—*E.Z.S.*

12H–31 551.510.53:551.510.41:551.513

Brewer, A. W., **Evidence for a world circulation provided by the measurements of helium and water vapor distribution in the stratosphere.** *Royal Meteorological Society, Quarterly Journal*, 75(326):351–363, Oct. **1949.** 5 figs., 16 refs., 13 eqs. **DWB**—Observations of vertical distribution of water vapor and helium show that in air just above tropopause, the humidity mixing ratio falls in 1 km by nine tenths to 195–200°K. This is attributed to equatorial air dried by condensation moving polewards in lowest stratosphere. Helium is constant with height indicating turbulence compatible with strong wind shear just above tropopause. The mean relative humidity more than in the stratosphere was found about 3 per cent. (*Same item as* 5D–147, April 1954, *Met. Abs.*) *Subject Headings:* **1. Tropopause humidity 2. Stratospheric circulation 3. Stratospheric turbulence**—*C.E.P.B.*

12H–32 551.593.652(445.9)

Dessens, Henri, **Les altocumulus lenticularis margarodes. Observation des brillantes colorations des altocumulus nacrés: interpretation très simple par interférences dues à de minces lamelles de glace.** [Iridescent altocumulus lenticularis. Observations of brilliant coloration of nacreous altocumulus: very simple explanation through interference due to thin flakes of ice.] *Annales de Géophysique*, Paris, 5(4):264–274, Oct.–Dec. **1949.** 9 figs., 13 refs. **DLC, DWB**—The colors observed on iridescent altocumulus lenticularis, as well as on nacreous clouds, can be attributed to interference of sunlight passing through numerous infinitesimal ice spicules, rather than to water clouds as has been supposed heretofore. The author cites Weickmann, Langmuir, Schaefer, and Woolard to support his argument. Temperatures at heights of the clouds observed and photographed on Sept. 10 and Oct. 16 and 25, and Nov. 1, 1949 at St-Gaudens and Puy de Dôme were so low that the probability of their being of water was slight. The crucial consideration is whether or not the ice prisms are oriented in one plane or are heterogenously distributed as would be the case if falling (spirally) in calm air. (*Same item as* 8–137, Aug. 1950, *Met. Abs.*) *Subject Headings:* **1. Nacreous clouds 2. Iridescent altocumulus 3. Central France.**—*M.R.*

12H–33 551.510.53:551.571.7:551.593.652(789)

Gutenberg, Beno, **New data on the lower stratosphere.** *American Meteorological Society, Bulletin*, 30(2):62–64, Feb. **1949.** fig., table, 7 refs. **DWB**—Brief discussions of rawinsonde observations to 30+km starting in March 1947 over White Sands, New Mexico. Tropopause found usually between 45 and 55,000 ft (ca. 17 km) with maximum wind velocity generally at 40,000 ft (12 km). References made to accounts of other wind, pressure and temperature observations from very great heights. Humidity measurements at great heights are rarely accurate, and few data were available above about 35,000 ft (10 km). The humidity was found between 20 and 35 per cent at the highest levels of observations. Reference is made to the existence of mother-of-pearl

clouds which show that saturation occasionally does occur at altitudes between 20 and 30 km. (70,000–100,000 ft.). (*Same item as* 5D–237, April 1954, *Met. Abs.*) *Subject Headings:* **1. Stratospheric research 2. Water vapor 3. Nacreous clouds 4. White Sands, N. Mex.**—*M.P.K.*

12H–34 551.571.7:551.510.53

Shellard, H. C., **Humidity of the lower stratosphere; the results of high-level ascents by aircraft of the Meteorological Research Flight.** *Meteorological Magazine*, London, 78(930):341–349, Dec. **1949.** 7 figs., 2 tables, 2 refs. **DWB**—Results of 64 flights reaching stratosphere are discussed, with tropopause as reference level. A more precise definition is given of Types I, II, III of tropopause. Mean relative humidity drops from 43% at tropopause to 5.3% 25 mb above and 2.7% 75 mb above. Fall of frost point from 50 mb below to 50 mb above, is 5.8°F in Type I, 1.9 in Type II. There is often a discontinuity in frost point in Type I, but not in Type II. Significant correlation is found between frost point and pressure and temperature. (*Same item as* 3–99, and 5D–154, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. Stratosphere 3. Tropopause types.**

12H–35 551.571.7:551.510.53(420)

†Sheppard, Percival A., **The exploration of the upper atmosphere.** *Science Progress*, London, 37:488–503, **1949.** 6 figs., table, 37 refs. **DWB**—Review of contemporary information of various methods and techniques of upper atmospheric research. The author referring to DOBSON and others points to the rapid fall of water vapor concentration in the first 1 km above the tropopause above England. The mother-of-pearl clouds found around 27 km indicate that the relative humidity of the stratosphere is not always low. (*Same item as* 4F–47, June 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Vertical water vapor distribution 3. Nacreous clouds 4. England.**—*E.K.*

1950

12H–36 551.571.7:551.510.53

*Barrett, Earl W., Herndon, Lee R., Jr. and Carter, Howard J., **Some measurements of the distribution of water vapor in the stratosphere.** *Tellus*, 2(4):302–311, Nov. **1950.** 7 figs., 3 tables, 5 refs. **DLC, DWB**—Continuing the work reported by the authors in the *Journal of Meteorology* (*see* 12H–30), the authors present the results of 3 radiosonde ascents to very high altitudes (28–32 km) using an experimental electric dew point hygrometer. The temperature and dew point, vapor pressure and mixing ratio for heights from 14–30 km are especially interesting. The water vapor content increases with height above the tropopause. A table shows the proportion of water vapor in the stratosphere up to 30 km. It is believed that ice crystals, carried upward and distributed alterally in the stratosphere, account for this increase. (*Same item as* 2.8–100, Aug. 1951, *Met. Abs.*) *Subject Headings:* **1. Water vapor measurements 2. Stratosphere 3. Dew point hygrometers.**—*M.R.*

12H–37 551.510.41:551.571

†Bates, David R. and Nicolet, Marcel, **The photochemistry of atmospheric water vapor.** *Journal of Geophysical Research*, Wash., D. C., 55(3):301–327, Sept. **1950.** 2 figs., 5 tables, 70 refs., 86 eqs. **DLC**—The concentration of OH radicals is estimated to fall to 10^{-5} at tropopause. They are formed by dissociation of water vapor by sunlight. These and other hydrogen compounds are broken up about 90 km. The hydrogen escapes to space; the oxygen remains and the amount added to the atmosphere during geological time is roughly equal to that present. The reactions between H and O_3 are considered responsible for night sky light. (*Same item as* 2.4 46, April 1951, *Met. Abs.*) *Subject Headings:* **1. Water vapor 2. Atmospheric composition.**—*C.E.P.B.*

12H–38 551.593.653(473)

Bronshten, V. A., **Iarkie serebristye oblaka, nabliudavshiesia 20–21 iiunia 1950 g. pod Moskvoi.** [Bright noctilucent clouds observed near Moscow on June 20–21, 1950.] *Priroda*, Moscow, 39(11):50, Nov. **1950.** 4 refs. **DLC**—The noctilucent clouds observed in the vicinity of Moscow on the night of June 20–21, 1950 occupied the total northern part of the horizon from NW to NE. A very bright ray, parallel to the horizon, stood out to the NE. The field of clouds on the N and NW side had a very complicated structure. The clouds moved with speed toward the west and gradually vanished. The observation lasted from 11:45 P.M. to 1:30 A.M. Estimating their heights as 80 km, the clouds were 400 to 900 km from Moscow. The author, while admitting that it has not yet been determined, is inclined to consider the phenomenon as the result of condensation of ice crystals on meteoric dust. (*Same item as* 2.4 195, April 1951, *Met. Abs.*) *Subject Headings:* **1. Noctilucent clouds 2. Moscow, U.S.S.R.**—*C.K.*

12H–39 551.571.7:551.521.1

Brewer, Alan W., **The measurement of the water vapour content of the atmosphere by dew- or frost-point measurement.** *International Union of Geodesy and Geophysics. Association of Meteor-*

ology, Oslo 1948, *Transactions*, Vol. 2; pub. **1950.** p. 56–58. Mimeographed. **DWB**—An equation for determining the water vapor height profile in the lower stratosphere is derived on the assumption of continuous and smooth movement of air from the tropopause to the stratosphere and downward from stratosphere to troposphere. It is shown that the smoothness of the ordinary temperature-height curve is not due to small scale turbulence but most probably to radiation. (*Same item as* 4.1–160, Jan. 1953, *Met. Abs.*) *Subject Headings:* **1. Water vapor measurements 2. Humidity lapse rate 3. Radiation effects.**—*I.L.D.*

12H–40 551.593.652

†Dietrichs, Heinz, **Über die Entstehung der Perlmutterwolken.** [On the origin of mother-of-pearl clouds.] *Meteorologische Rundschau*, 3(9):208–213, Sept./Oct. **1950.** 8 figs., 53 refs. German and English summaries p. 208. **DWB, DLC**—Surface pressure distributions and tracks of depressions (indicating upper winds) are plotted for occasions of mother-of-pearl clouds. A close connection is found with weather type (S. Norway N. W., N; British Isles Wly.; N. Scandinavia N. of W.). The clouds are attributed to condensation in a cold stratosphere due to vertical waves in the lee of mountains. Observations in India and Alaska are also mentioned. (*Same item as* 2.2–155, Feb. 1951, *Met. Abs.*) *Subject Heading:* **1. Nacreous clouds.**—*C.E.P.B.*

12H–41 551.510.53:551.571.7

Dobson, G. M. B., **Physics and the atmosphere.** *Physical Society, London, Proceedings, Sec. B*, 63(4):252–266, April 1, **1950.** 8 figs., 12 refs. **DLC** (QC1.P53)—The author discusses atmospheric ozone, the humidity of the upper atmosphere and ice-forming nuclei in the atmosphere. In relation to the methods of measuring humidity, the dew-point (frost-point) hygrometer is described. First accurate measurements of humidity in the stratosphere were made in a Fortress aircraft on Aug. 26 and Sept. 7, 1943. A reduction in atmospheric humidity with height was noted. On Dec. 22, 1943 the aircraft reached heights well within the stratosphere and the measurements left no doubt that the stratospheric air was very dry. This conclusion has been confirmed by some hundred or more ascents made by the Meteorological Research Flight of the Air Ministry. Two charts are included; one shows the changes in frost-point and temperature with height, the other shows the average changes during the summer and winter in the neighborhood of the tropopause. *Subject Headings:* **1. Frost point hygrometer 2. Stratospheric humidity 3. Humidity measurement techniques.**—*E.Z.S.*

1951

12H–42 551.510.53:551.513

Clarkson, L. S., **Evidence for a stratospheric circulation in vertical meridional planes between polar and equatorial regions in winter.** *Meteorological Magazine*, London, 80(953):309–318, Nov. **1951.** 5 figs., 23 refs. **DWB**—Author discusses contemporary cross sections from Arctic to Antarctic. Tropopause at equator is lower and warmer in July than January. In Antarctic troposphere is much colder than in Arctic especially in summer. As causes greater extent of oceans and greater cloudiness are inadequate and transport of ozone is adopted main cause. This leads to a unified scheme of stratospheric circulation, consisting of a descent at equator, flow in lower stratosphere from equator to pole and return flow at greater heights. In winter circulation is stronger in S than in N hemisphere. This is consistent with GOLDIE's reconstruction. The lower stratosphere is warmed by the absorption of long-wave outgoing terrestrial radiation by the atmospheric constituents such as carbon dioxide, water vapor and ozone. In the lower equatorial stratosphere at an altitude of about 20 km the absorption of long-wave radiation depends on the concentration of water vapor, carbon dioxide and ozone. (*See items* 3.3–90, March 1952, and 5D–179, April 1954, *Met. Abs.*) *Subject Headings:* **1. Stratospheric circulation 2. Terrestrial radiation 3. Water vapor 4. Carbon dioxide 5. Ozone.**—*C.E.P.B. and E.K.*

12H–43 551.571.7:551.510.52

Dobson, G. M. B. and Brewer, Alan W., **Water vapour in the upper air.** (In: **Compendium of meteorology,** issued Boston, American Meteorological Society, **1951.** p. 311–319. 10 figs.) **DWB, DLC**—The problem of measuring very small water vapor pressures is treated and the construction of a frost-point hygrometer is described. Measurements of water vapor pressure made by means of aircraft ascents are compared with those made with radiosonde balloons. Results are given for the lower stratosphere, and the upper troposphere for different weather situations. Ascents into the stratosphere (southern England) showed the frost point generally falling with height in the region of the tropopause, but above this is an immediate increase in the rate of fall, and one or two km above the tropopause the air normally has a frost point of about 190–200° K and a humidity with respect to ice of 2 or 3 per cent. (*See item* 4.4–5, April 1953, *Met. Abs.*) *Subject Headings:* **1. Water vapor pressure measurements 2. Troposphere 3. Stratosphere 4. England.**—*A.A.*

12H–44 551.510.41:551.571.1

Harteck, P. (*Inst. für physikalische Chemie der Univ. Hamburg*), **Chemie und Photochemie in der Erdatmosphäre.** [Chemistry and photochemistry in the Earth's atmosphere.] *Angewandte Chemie*, 65(1):1–7, Jan. 1951. 3 tables, 3 eqs., refs. **DLC**—Besides the conditions which affect the absorption and release of constituent elements of the atmosphere, the budget of water vapor, nitrogen and oxygen is of particular interest. In the highest layer of the atmosphere water vapor is split into practically irreversible atoms; while nitrogen ions escape the Earth's gravity easily, the oxygen remains and heavier nitrogen will concentrate. Argon is the most abundant in the series of inert gases, continuously reproduced through radioactive processes. *Subject Headings:* **1. Chemical composition of atmosphere 2. Water vapor dissociation.**—(*Based on author's abstract.*)

12H–45 551.521.326:535.33 551.510.535:541.14

Krasovskiĭ, V. I., **Vliianie parov vody i okislov ugleroda i azota na svechenie nochnogo neba.** [Influence of water vapor, carbon monoxide and nitric oxide on the luminescence of the night sky.] *Akademiia Nauk USSR, Doklady*, 78(4):669–672, **1951.** 18 refs., 5 eqs. **DLC**—The important reactions considered are $H_2O+O \rightarrow OH+OH$; $H+CO+M \rightarrow HCO+M$ (where M is any molecule or atom occurring in the atmosphere), $HCO+HCO \rightarrow H_2CO+CO$, by which WILD proved the occurrence of formaldehyde in the atmosphere of Venus, and to which a parallel was found in 1946 when the solar radiation was directly observed at altitudes >50 km and an absorption band ~2850A was discovered near which the maximum absorption of aldehydes and ketones is located, organic compounds of which formaldehyde is the simplest. Furthermore, $NO+O \rightarrow NO_2+hv$; $NO_2+O \rightarrow NO+O_2$. Atomic oxygen in the 'D and 'S states has an excitation energy exceeding the activation energy of reaction (1). Thus H_2O must be regarded as the most active quencher of excited metastable states of atomic oxygen and the hydroxyl can therefore only be formed in the ground state of oscillation. The possible maximum excitation of OH corresponds to the second oscillation level in the case O('D) and to the 9th of O('S). Water vapor dissociates into OH and H only under radiation $\lambda < 1400$A. Such a process is only possible in the ionosphere. Reaction (1) proves that H_2O vapor may dissociate into OH wherever there are excited metastable O-atoms. In a sustained reaction between OH and O or N atomic H may appear independently of the presence of radiation <1400A. The quenching effect of H_2O vapor on excited atomic O which reduces the intensity of the known emission of the night sky near 6300 and 5577A may be used as a criterion of the moisture content of high layers of the atmosphere. The 5577A radiation emitted at the lowest level may be totally quenched in the zone of active formation of the silver clouds. This opens a way for using luminescence of the night sky as a new means of meteorological investigation and prediction. (*Same item as* 6E–90, May 1955, *Met. Abs.*) *Subject Headings:* **1. Night airglow spectrum 2. Photochemistry of upper atmosphere.**—*Physics Abstracts, No.* 9852, 1951.

12H–46 551.576.4(420)

Very high cloud layer, August 10, 1951. *Meteorological Magazine*, London, 80(954):356–366, Dec. **1951. DLC, DWB**—A pilot who flew at about 45,000 ft from the London area to Lancashire and back observed a thin cloud layer at an altitude of 47,000 ft. The bottom and the top of the cloud were found to be 46,500 and 47,500 ft respectively. The pilot had never before seen cloud above 42,000 ft while flight-testing to altitudes of 50,000 ft over the previous three years. During the flight the tropopause was at 37,000–40,000 ft with an inversion to 40,000–44,000 ft decreasing above these levels to an almost isothermal lapse rate. The wind at 45,000 ft was 340° 30 kt, and at 50,000 ft 340° 15–20 kt. (*See item* 4.1–176, Jan. 1953, *Met. Abs.*) *Subject Headings:* **1. Cloud height measurements 2. Stratospheric clouds 3. Lancashire, England.**—*E.K.*

1952

12H–47 551.571.7(420)

*†Bannon, J. K.; Frith, R. and Shellard, H. C., **Humidity of the upper troposphere and the lower stratosphere over southern England.** *Great Britain. Meteorological Office, Geophysical Memoirs*, 11(88), **1952.** 36 p. 19 figs., 14 tables, 13 refs. **DWB**—Observations of air temperature and frost point on 130 flights from Boscombe Down 1943–46 and South Farnborough 1949–50 are summarized for pressure levels 500–187 mb and at tropopause, by seasons Jan.–March, April–June etc., separately for different tropopause levels. Air mass and circulation types are also given. The variation of relative humidity over ice is tabulated from 50 mb below to 100 mb above tropopause, and also as a function of temperature and frost point. Mean half-yearly curves of frost point and temperature are shown for ascents grouped in various ways according to tropopause type or height. Relations between frost point and tropopause pressure, 500 mb temperature, circulation type, air mass and frontal surfaces are set out and 21 observations near jet. (*Same item as* 4.1 159, Jan. 1953, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. Upper air temperatures 3. Frost point 4. England.**—*C.E.P.B.*

12H–48 551.521.18:551.507.362.1

Denver. University. Department of Physics, **Daylight luminescence and infrared absorption.** Contract W19-122-ac-16, Final Report [1952]. 34 p. Table, 21 plates, refs. **DWB**—A summary of 16 reports (from July 1, 1948 through April 30, 1952) with brief notes on the period from April 30 through May 31, 1952. Daylight luminescence was measured with spectrographic equipment carried by balloons to 53,000 and about 100,000 ft, respectively. Elaborate spectrometers and photographic equipment for recording infrared absorption from V-2 rockets have been developed and tested in the laboratory on Mount Evans, Colo. (el. 14,150 ft), by means of balloon ascents and spectrographs, to show absorption between 4.3 to 0.4μ. Observational data on: 1) atmospheric water vapor determination by means of infrared spectroscopy, 2) spectro-solar intensity in the infrared, 3) color temperature of the sun and 4) solar energy at earth's surface are presented in diagram and discussed. F. E. Fowle's method of determination of precipitable water from infrared spectrum is verified in general and its reliability discussed. (*Same item as* 6.4–184 and 11I–22, *Met. Abs.*) *Subject Headings:* **1. Daylight luminescence 2. Infrared absorption 3. Precipitable water vapor 4. Rocket instrumentation.**—*W.N.*

12H–49 551.576.11:551.510.53(420)

Farquharson, James Strachan, **Cloud in the stratosphere.** *Meteorological Magazine*, London, 81(965):341–345, Nov. **1952.** 3 figs., ref. **DWB**—The author refers in his note to the cloud layer observed by a pilot at 47,000 ft height over England on August 10, 1951. (*See* 12H–46.) Upper air observations over England and Wales, Aug. 9–10, 1951 show that cooling was occurring throughout the layer within which the cloud formed and at the relevant time. The observation on Aug. 25, 1952 confirms the idea that in disturbed weather in summer, vertical movements in the lower stratosphere may lead to condensation in the "semi-permanent layer of saturation" at these heights. It is suggested that dynamic cooling of this saturated layer leads to the clouds observed. (*Same item as* 4.4–194, April 1953, *Met. Abs.*) *Subject Headings:* **1. Stratospheric clouds 2. Vertical humidity distribution 3. England.**—*E.K.*

12H–50 551.593.653:551.510.53

Khvostikov, I. A., **Serebristye oblaka i stroenie stratosfery.** [Noctilucent clouds and the structure of the stratosphere.] (In: Akademiia Nauk SSSR, **Pamiati Sergeia Ivanovicha Vavilova.** Moscow, **1952.** p. 349–362. 5 figs., photo, table, 6 refs.) **DLC** (QC16.V3A7). Also: Morozov, V. M., **K voprosu o proiskhozhdenii serebristykh oblakov.** [Origin of noctilucent clouds.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 7:865–869, July **1956.** 23 refs. Also: Khvostikov, I. A., **O prirode serebristykh oblakov.** [Nature of noctilucent clouds.] *Ibid.*, p. 869–872. (Answer to preceding article.) **DLC**—Authors discuss the following subjects: the origin of noctilucent clouds; the possibility of the presence of water vapor at an altitude of 75–80 km; the zone of noctilucent clouds as a boundary layer; the cause of the constancy of the height of noctilucent clouds and their nature; the general theoretical picture of cloud zones in the stratosphere; the size of particles constituting noctilucent clouds; and observations of noctilucent clouds as a possible method for investigating the upper boundary of the stratosphere. (*Same item as* 9.7–268, July 1958, *Met. Abs.*) *Subject Headings:* **1. Noctilucent clouds 2. Stratospheric clouds 3. Stratospheric structure.**—*I.L.D.*

12H–51 551.571.7:551.510.535

Lettau, Heinz, **Zur Frage der Sauerstoff- und Wasserdampf-Bilanz der Atmosphäre.** [The oxygen and water vapor balance of the atmosphere.] *Zeitschrift für Naturforschung*, Sec. A, 7(3/4):270–273, March/April, **1952.** 2 eqs., 9 refs. **DLC**—The article discusses VON HARTECK and JENSEN's view regarding the formation of oxygen by photochemical decomposition of water vapor in the E layer. They conclude that the possibility of considering the effectiveness of these processes by vertical diffusion of H_2O vapor through the lower stratosphere is highly questionable. The numerical conclusions of VON HARTECK and JENSEN are based on the moisture constant of the lower atmosphere and are contrary to the meteorological observational data obtained. Their accepted humidity value at 16 km is probably 10 times too high. (*Same item as* 3.9–80, Sept. 1952, *Met. Abs.*) *Subject Headings:* **1. Water vapor dissociation 2. Vertical water vapor distribution 3. E-layer.**—*E.K.*

12H–52 551.521.3:551.571

†London, Julius, **The distribution of radiational temperature change in the Northern Hemisphere during March.** *Journal of Meteorology*, Boston, 9(2):145–151, April **1952.** 6 figs., 2 tables, 37 refs., 10 eqs. **DWB, DLC.** Also paper of same title issued as: *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers.* No. 18. Dec. **1952.** 64 p. 19 figs., 12 tables, bibliog. p. 57–64. **DLC**—Northern Hemisphere zonal pressure, temperature and effective depth of water vapor up to 16 km, and amount and type of cloud, are tabulated for March. The infrared radiation flux through each level is calculated and the distribution of radiation cooling in the tropopause is shown by heights and latitude, for clear skies and average cloud. Heating due to absorption of insolation

y water vapor is similarly calculated, the difference giving the net cooling. The entire troposphere ses heat by radiation, the maximum (1.5–2 C/day) being at heights of middle clouds (3–4 km). his loss is mostly offset by latent heat of condensation. (*Same items as* 3.9–123, and 5.9–151, *Met. bs.*) *Subject Headings:* **1. Radiation balance 2. Radiational temperature change 3. Vertical ater vapor distribution 4. Northern Hemisphere.**—*C.E.P.B.*

12H–53 551.574.1:536.42:551.593.652

Mason, B. J., **The spontaneous crystallization of supercooled water.** *Royal Meteorological ociety, Quarterly Journal*, 78(335):22 27, Jan. **1952.** 19 refs., 5 eqs. **DWB**—It is shown theo- tically that the rate of nucleation of the ice phase in supercooled water changes very rapidly with emperature in the neighborhood of −40°C. Thus, in chilling a supercooled water cloud below this emperature one would expect to observe a rapid increase in the number of ice crystals which appear s the temperature falls. This is verified by observations made in a cold chamber. It is tentatively uggested that the parts of mother-of-pearl clouds showing iridescence at temperatures around -80°C consist of sphere of "glassy" ice, which may eventually crystallize spontaneously to form ice rystals toward the leeward edges of the cloud. (*Same item as* 6F–193, June 1955, *Met. Abs.*) *ubject Headings:* **1. Ice crystal formation 2. Nacreous clouds.**—*From author's summary.*

12H–54 551.501.771:551.571.7

Schulze, Werner, **Zur Trägheit und Feuchtemessung des gewalzten Haares nach Franken- erger.** [On the lag and humidity measurements of rolled hair according to Frankenberger.] *nnalen der Meteorologie*, 5(1–2):35–45, **1952.** 9 figs., table, 5 refs. English summary p. 45. dem: **Zur Feuchtemessung in der freien Atmosphäre mit dem gewalzten Haar.** [Humidity neasurement in the free atmosphere with rolled hair.] *Ibid.*, 5(7–12):223–226, **1952.** 3 figs., refs. **DWB, DLC**—In the first article a method of determining the lag of rolled hair, used in laily radiosonde ascents since Feb. 1951 to measure humidity, and the dependence of lag coefficients n absolute humidity are considered. The first extensive series of humidity measurements—includ- ng altitudes above the tropopause—and some of the results are discussed. Appended graphs show bserved data. The second article is a continuation of the first. Individual humidity measurements nd the results obtained are treated in detail. Temperature and relative humidity profiles up to 00 km were established. (*Same items as* 4.11–63 and 5.9–61, *Met. Abs.*) *Subject Headings:* **1. Hy- grometers 2. Upper air humidity measurements.**—*E.K.*

12H–55 551.506.5(99):551.571.7(99)

Schumacher, Nils Jörgen, **The Maudheim Expedition, 1949–52, Pt. 1.** *Weather*, 7(10):314–319, Oct. **1952.** 3 plates. **Pt. 2, Upper air investigations.** *Ibid.*, 7(11):327–334, Nov. **1952.** table, 2 plates. **DWB, DLC**—Pt. 1 is an account of the instruments set up at 71°3′S, 10°56′W, in a Nor- wegian screen, and of difficulties in making surface meteorological observations. Records included vertical gradient of wind, temperature and humidity. The heights reached by the sounding balloons were about 18–23 km during summer, and 12 to 15 km in the winter. Humidity readings in winter were considered to be very unreliable. In Pt. 2, the methods of generating hydrogen and releasing sondes, and notes on surface (with temperature table) and upper air conditions obtained from these soundings, optical phenomena and the planning of a meteorological expedition are discussed. (*Same item as* 4.4–41, April 1953, *Met. Abs.*) *Subject Headings:* **1. Maudheim Expedition 2. Water vapor measurements 3. Antarctica.**—*C.E.P.B.*

12H–56 551.506.7:551.508.822:551.571.7

Suomi, Verner E. and Barrett, Earl W., **An experimental radiosonde for the investigation of the distribution of water vapor in the stratosphere.** *Review of Scientific Instruments*, N. Y., 23(6):272–292, June **1952.** 20 figs., 2 tables, 7 foot-refs., numerous eqs. **DLC** (Q184.R5)—Following a short discussion of the limitations of the various types of balloon-borne radiosondes when used to gather information in the stratosphere, an analysis of the reasons for these limitations and some means for circumventing them are presented. For humidity measurement, only the condensation (dew point) technique is capable of giving meaningful data at great heights. The balance of the paper describes in detail a complete sounding instrument consisting of a hypsometer, a fine-wire thermo junction, and a fully automatic electronic dew-point hygrometer, together with the necessary amplifier, radio telemetering equipment, and internal calibration standard. The telemetering system is of special interest due to the relatively great accuracy obtainable with a very simple arrangement of components, utilizing only a modified Diamond-Hinman radiosonde. The instrument described in this paper has been flown to altitudes of over 30 km, using "Skyhook" plastic balloons; these flights yielded the first detailed pictures ever obtained of the moisture distribution in the stratosphere. On each ascent at least one region of ice saturation was encountered at or just below the tropopause, with a double layer appearing in one case. During the summer season the water vapor mixing ratio

tended to increase with altitude. On one ascent this increase was extremely great, the mixing ratio at 30 km reaching a value twenty times as great as that at 17 km. On a winter flight the reverse distribution was observed. Schematic diagrams and photographs of the instruments and equipment are included. *Subject Headings:* **1. Radiosonde observations 2. Radiosonde instruments 3. Vertical water vapor distribution.**—*Authors' abstract and E.Z.S.*

1953

12H–57 551.513.1:551.510.534:551.571.7

Brewer, A. W. (*Clarendon Lab., Oxford*), **The variations of ozone and water vapour concentrations: the value of observations.** *International Union of Geodesy and Geophysics. Association of Meteorology, Brussels, 1951, Procès-Verbaux des Séances. Mémoires et Discussion*, pub. **1953.** p. 338–345. 3 figs. **DWB**—Shows how knowledge about the general stratospheric circulation and its interaction with the troposphere could be obtained by the measurement of the average vertical ozone and water vapor profiles up to 25 km at all latitudes. Three cases are discussed: a) no mean circulation, b) a single mean circulation with a stratospheric movement towards the poles, and c) a double mean circulation meeting at the equatorial tropopause. (*Same item as* 8.3–157, and 10E–131, *Met. Abs.*) *Subject Headings:* **1. Atmospheric circulation 2. Ozone concentration 3. Water vapor profiles.**—*A.A.*

12H–58 551.571.7:016:019.941

†Miller, Lewis E., **Vertical distribution of water vapor in the stratosphere and upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 45, Sept. **1953.** 118 p. tables, graphs, 149 refs. (118 with abstracts), eqs. **DWB, DLC**—An intensive and extensive review of the literature on many aspects of observation or determination of water vapor content in the upper atmosphere. The historical review, theory, discussion of instruments and methods, analysis of results and presentation of quantitative data in tabular and graphic form occupy the first portion. Abstracts of about 150 articles and a bibliography arranged chronologically by subject area, plus an author index make this a valuable reference source. A few items on mother-of-pearl clouds, auroras and night sky light are included as they have bearing (indirectly) on water vapor content. (*Same item as* 5.7–8, July 1954, *Met. Abs.*) *Subject Headings:* **1. Water vapor in stratosphere 2. Abstracts 3. Bibliographies.**—*M.R.*

1954

12H–59 551.508.71 551.571.7:551.510.53(749)

Brasefield, C. J., **Measurement of atmospheric humidity up to 35 kilometers.** *Journal of Meteorology*, 11(5):412–416, Oct. **1954.** 6 figs., 5 refs. **DWB**—The "hygristor," a small LiCl resistance radiosonde hygrometer, and its calibration are described. Soundings to 30–35 km show that dew point and mixing ratio frequently increase above tropopause, in agreement with results of Regener and with mother-of-pearl clouds. At 19 km above New Jersey on Aug. 17, 1953, dew point reached −62.5°C and doubtfully increased still further at higher levels. (*Same item as* 6.3–56, March 1955, *Met. Abs.*) *Subject Headings:* **1. Hygristors 2. Lithium chloride hygrometers 3. Humidity of the stratosphere 4. New Jersey, U. S.**—*C.E.P.B.*

12H–60 551.510.53(02)

*†Goody, R. M. (*St. John's College, Cambridge*), **The physics of the stratosphere.** Cambridge, University Press, **1954.** 187 p. 60 figs., 17 tables, bibliog. p. 176–181, eqs. Price: $5.00. (*Cambridge Monographs on Physics*). **DLC** (QC879.G68). Transl. into Russian by S. F. Shushurin, ed. by E. G. Shvidkovskiĭ, with title **Fizika stratosfery.** Issued Leningrad, Gidrometeoizdat, **1958.** 171 p. 61 figs., 17 tables, 214 refs., eqs.—A simple and accurate treatment of the structure, composition and energy conditions in the upper atmosphere, with emphasis on experimental rather than theoretical results. The latest equipment, including rockets, is considered. The chapter on composition of the stratosphere contains a discussion on water vapour measurements before 1940, an explanation of the operation and construction of the frost-point hygrometer, and balloon measurements. It also contains a discussion on the various constituents of the stratosphere and stratospheric clouds. Mother-of-pearl clouds at heights 22.0–28.5 km are believed to be orographic clouds. Noctilucent clouds are also described. The composition of these clouds is still a matter of debate, and both ice crystals and volcanic dust have been suggested. The last chapter is especially complete and up-to-date, taking up the latest theoretical and experimental knowledge of the radiation balance in the stratosphere, the effects of various gases (H_2O, CO_2, NO and O_2) on the absorption of solar and terrestrial radiation, line shapes, spectroscopy and, finally, the effect of radiation balance on tropopause temperatures and vice versa. (*Same item as* 5.5–5, 11B–54 and 11I–41, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere physics textbooks. I. Shushurin, S. F.** (transl.).—*M.R.* and *E.Z.S.*

12H–61 551.571.7:551.510.53(420)

Murgatroyd, R. J.; Goldsmith, P. and Hollings, W. E. H., **An interim report on measurements of humidity from aircraft to heights of about 50,000 feet over southern England.** *Great Britain. Meteorological Research Committee, M.R.P.* 877, Sept. 9, **1954.** 11 p. 4 figs., 2 tables, 6 refs. Mimeo. **DWB**—Regular observations with Dobson-Brewer pressurized hygrometer in a Canberra up to 50,000 ft over S. England are described. Observations at 5000 to 50,000 ft are tabulated and discussed for 21 flights. At tropopause, frost point ranged from −65 to −96°F lower for high than low tropopause. About 50,000 ft (100 mb above tropopause) values cluster round −120°F (relative humidity over ice at −60°F 0.7%). There may be a "humidity tropopause" a few thousand feet above temperature tropopause. (*Same item as* 6.6–258, June 1955, *Met. Abs.*) *Subject Headings:* **1. Stratospheric humidity 2. England.**—*C.E.P.B.*

12H–62 551.508.71:551.508.822:551.571.7

Raab, Lars (*Swedish Met. and Hydrol. Inst., Stockholm*), **The Finnish radiosonde with rolled hair as hygrometer.** *Tellus,* 6(4):405–407, Nov. **1954.** 2 figs., 2 refs. **DLC**—As shown on two charts (of temperature and humidity up to 19 km) the rolled hair hygrometer element used in a Finnish radiosonde gave much more sensitive records of humidity both in the low troposphere inversion (Jan. 27, 1954) and in the stratosphere than did the normal hair hygrometer (as shown on same graph). The rolled hair gave humidities ranging from 100% down to <15%, whereas the normal hair did not go below 60% or above 80%, and indicated nothing at all (no variation) above 600 mb level. Rolled hair is good to −70°C, though correction factors are not as accurate in stratosphere as in lower levels. It is not yet adaptable to audiofrequency radiosondes. (*Same item as* 8.1–153, Jan. 1957, *Met. Abs.*) *Subject Headings:* **1. Hair hygrometers 2. Radiosonde hygrometers.**—*M.R.*

12H–63 551.593.653

Zerinváry, Szilárd, **A világító ezüstfelhők és eredetük.** [Noctilucent clouds and their origin.] *Időjárás,* Budapest, 58(30):169–178, May/June **1954.** 8 figs., 2 tables. Russian and French summaries p. 169. **DWB, DLC**—Theories concerning the origin of noctilucent clouds are reviewed. Discussed in particular is the theory of VEGARD, who assumes the noctilucent clouds to be derived from free hydrogen atoms coming from outer space in close relation to solar corpuscular radiation. These free hydrogen atoms and the oxygen atoms present at 80 km altitudes form H_2O. The other theory discussed is KHVOSTIKOV's, who analyzed the role played by vapor pressure and atmospheric pressure in the formation of noctilucent clouds. (*Same item as* 6.5–332, May 1955, *Met. Abs.*) *Subject Heading:* **1. Noctilucent clouds.**—*E.K.*

1955

12H–64 551.508.71:551.501.771(41–4)

Goldsmith, P., **A method of increasing the range of the Dobson-Brewer frost point hygrometer in jet aircraft.** *Royal Meteorological Society, Quarterly Journal,* 81(350):607–609, Oct. **1955.** 2 figs., 3 refs. Also issued as *Great Britain. Meteorological Research Committee, M. R. Paper,* No. 859, March 25, **1954. DWB**—The Dobson-Brewer hygrometer requires an experienced operator to obtain readings below about −100°F (−73°C). At temperature below about −120°F (−85°C) any frost deposit may be glassy in form and difficult to observe without special arrangements. Over the United Kingdom the frost point is usually about −100°F (−73°C) at 40,000 ft and −120°F (−85°C) at 50,000 ft (MURGATROYD, GOLDSMITH and HOLLINGS 1955). The range of the hygrometer can be extended to frost point below −120°F at 30,000–50,000 ft by supplying it with compressed air from the engine compressor of a jet aircraft. A comparison of the frost point obtained to 50,000 ft by the normal and compressed air methods is presented. (*Same item as* 6.4–68, and 7.11–127, *Met. Abs.*) *Subject Headings:* **1. Dobson-Brewer frost point hygrometer 2. Frost point measurements 3. United Kingdom.**—*E.K.*

12H–65 551.571.7(410)

Helliwell, N. C.; Mackenzie, J. K. and Kerley, M. J., **Further observations of humidity up to 50,000 feet made from an aircraft of the Meteorological Research Flight in 1955.** *Great Britain. Meteorological Research Committee, M. R. Papers,* 976, April 30, **1956.** 7 p. 5 figs., 3 tables, 6 refs. Mimeo. **DWB**—In continuation of M.R.P., 877, 1954 (*see* 12H–61), observations with a pressurized frost point hygrometer and flat plate thermometer around and over the British Isles are tabulated for 45 occasions, 5000–50,000 ft. Means and standard deviations are given for 1954 and 1955. The mean frost point decreases about 3½°F/1000 ft from 20,000–40,000 ft and then more slowly to approach −117°F at 50,000 ft. With high tropopause frost point is generally lower than with low tropopause. (*Same item as* 8.1–260, Jan. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. British Isles.**—*C.E.P.B.*

12H–66 551.510.53:551.593.653

Kaplan, J.; Schilling, G. F. and Kallmann, H. K., **Methods and results of upper atmosphere research.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 43. Nov. **1955.** 162 p. numerous figs., and tables, refs. at end of each chapter, eqs. **DLC**—In Chapter V, p. 67–72 noctilucent clouds are discussed. The two principal theories concerning the composition of these clouds are mentioned, both of which are able to explain the existence of clouds at these high altitudes. One theory assumes that the clouds are composed of water vapor in crystal form, according to the second theory, the clouds consist of dust particles which are either of volcanic or meteoric origin. The authors conclude, that no conclusive evidence has been found for or against either of the theories; however, there does not seem to be a clear correlation between the appearance of noctilucent clouds and meteoric activity or volcanic eruptions, a fact which favors the ice crystal theory over the other. (For abstract on the paper as a whole *see* 8.5–22, May 1957, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Noctilucent clouds.**—*E.K.*

12H–67 551.508.71(02)

†Penman, Howard Latimer, **Humidity.** London, Institute of Physics, **1955.** 71 p. 19 figs., 6 tables, 22 refs., 7 eqs. (*Institute of Physics Monographs for Students*) Price: 5 sh. Review by Malcolm Rigby in *Weatherwise*, Boston, 9(3):100, June **1956. DWB**—For the benefit of students and workers in agricultural meteorology and related fields various methods of measuring humidity are reviewed in this pocket size book. Following a discussion of water vapor in the atmosphere and the physical principles in vapor-liquid equilibrium, basic methods and the measurement of absolute humidity are explained. Various types of hygrometers are described: the dew-point hygrometer, the wet-and dry-bulb hygrometer and miscellaneous devices. The use of hygroscopic materials is considered. The frost-point hygrometer designed by DOBSON and his collaborators (1948) is described. It measures humidity up to 15 km, where air temperatures are of the order of 220°K and frost points may be 190°K. Two types of instruments were made for use on aircraft, one in which the deposit is viewed by the observer, and the other in which the amount of deposit is estimated photo-electrically. Schematic diagrams of the instruments are included. (For abstract on the entire book see 7.9–7 and 11B–109, *Met. Abs.*) *Subject Headings:* **1. Humidity measurement instruments 2. Humidity measurement textbooks.**—*E.Z.S.*

12H–68 551.571.7(422)

*Murgatroyd, R. J.; Goldsmith, P. and Hollings, W. E. H., **Some recent measurements of humidity from aircraft up to heights of about 50,000 ft over southern England.** *Royal Meteorological Society, Quarterly Journal*, 81(350):533–537, Oct. **1955.** 2 figs., table, 4 refs. **DWB**—Temperature observations and frost point observations with a pressurized Dobson-Brewer hygrometer from 5000–50,000 ft over S. England on 35 days in 1954 are tabulated and mean values plotted. The frost point decreased to a constant value of −115 to −120°F 10–15,000 ft above tropopause (mean temperature about −60°F). High tropopauses had lower temperature and frost point than low tropopauses, but this effect disappeared at higher levels. (*Same item as* 7.3–220, March 1956, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. S. England.**—*C.E.P.B.*

1956

12H–69 551.521.18

Brewer, A. W. and Houghton, J. T. (*both, Clarendon Lab., Univ. of Oxford*), **Some measurements of the flux of infra-red radiation in the atmosphere.** *Royal Society of London, Proceedings, Ser. A*, 236(1205):175–186, Aug. 2, **1956.** 23 figs., 14 refs. **DLC**—Results are reported of nine aircraft ascents on which the upward flows of infra-red radiation were measured and compared with values calculated using the radiation charts of ELSASSER and YAMAMOTO. The divergence of radiative flux deduced from these measurements clearly shows that the cooling in the troposphere is not very different from that calculated from radiation charts. The importance of clouds on the radiative pattern is demonstrated; at the moment, incomplete knowledge of cloud structure will be the chief factor limiting the value of calculations of atmospheric radiation. The measurements are of very limited value in the stratosphere, since, for the very small quantities of water there, the effective radiation is in the rotation band of water vapor (λ between 30 and 70μ), and the radiometer used was not sensitive to these wavelengths. If the use of radiation charts is extrapolated to these conditions they indicate that the radiative cooling continues in the lower stratosphere. This is in contrast with the 'classical' view that the stratosphere is in radiative equilibrium. Figures show the variation of absorption with wave length for water vapor of different path lengths, comparison of the emission at 220°K of 1μ of water vapor and that of a KRS5 window, with black-body emission at that temperature; and in addition a figure shows that the results of calculations of the divergence of radiative flux near the tropopause for two different assumptions about the conditions of temperature and humidity. *Subject Headings:* **1. Infrared radiation flux 2. Water vapor measurements.**—*Authors, abstract and E.Z.S.*

12H–70 551.508.71:551.501.771

Compressed air hygrometer for measuring frost point in the stratosphere. *Nature*, London, 177(4508):568, March 24, **1956. DWB**—In the Dobson-Brewer frost point hygrometer the ice deposit becomes glassy and difficult to see at −85°C. A. W. BREWER suggested using compressed air to extend the range of the instrument and P. GOLDSMITH proposed the use of the engine compressor of a jet aircraft for the purpose. Results of 35 ascents to 50,000 ft with this apparatus are summarized. (*Same item as* 7.8–73, Aug. 1956, *Met. Abs.*) *Subject Heading:* **1. Dobson-Brewer frost point hygrometer.**—*C.E.P.B.*

12H–71 551.521.32:551.521.18

*Larmore, Lewis (*Lockheed Aircraft Corp., Van Nuys, Calif.*), **Transmission of infrared radiation through the atmosphere.** *IRIS Proceedings* (Pub. by the U. S. Naval Ordnance Lab., Corona, Calif.), 1(1):14–23, June **1956.** 2 figs., 6 tables, 5 eqs. Appended: Passmann, Sidney and Larmore, Lewis, **Correction to atmospheric transmission tables.** p. 15–17, *Ibid.* (volume and number not known). 2 tables, 4 refs. both photostats of separated pages. **DWB** (M21.61 L324t)—Absorption of infrared radiation by water vapor, CO_2, O_3, is discussed and illustrated, and tables presented for calculation of various parameters of absorption and transmission in bands from 0.3μ to 7.0μ and for amounts of precipitable water of 0.01 cm to 100 cm or for CO_2 path length of 0.1 km to 1,000 km. Altitude correction for H_2O and CO_2 are also given for 1000 to 100,000 ft, etc. (*Same item as* 10.2–217, Feb. 1959, *Met. Abs.*) *Subject Headings:* **1. Infrared absorption of water vapor 2. Infrared transmission calculations 3. Infrared absorption of carbon dioxide 4. Infrared absorption of ozone.**—*M.R.*

12H–72 551.501.771:551.571.7

Measurement of humidity at high altitudes (Royal Meteorological Society Discussion). *Meteorological Magazine*, London, 85(1007):151–152, May **1956.** 2 refs. **DWB**—Account of a discussion on Feb. 15, 1956, opened by A. W. BREWER. The frost point hygrometer and its pressure-increase modification were described. Figures were given of the low frost point in the stratosphere at 50,000 ft. These could only be explained by the air having been cooled to those temperatures at some time. This only occurred in the equatorial tropopause and winter polar stratosphere. Other speakers dealt with the measurement of precipitable water by radiation and by balloon-borne spectrograph, and forms of ice at low temperatures. (*Same item as* 7.9–75, Sept. 1956, *Met. Abs.*) *Subject Headings:* **1. Humidity measurement techniques 2. Upper air humidity.**—*C.E.P.B.*

12H–73 551.510.53

†Paetzold, Hans-Karl, **Die Meteorologie der Stratosphäre.** [Meteorology of the stratosphere.] *Germany. Deutscher Wetterdienst, Berichte*, 4(22):43–54, **1956.** 17 figs., 3 tables, 61 refs., eqs. **DWB, DLC.** English transl. by Rudolf Loeser and James Gouch, Jr. issued by the American Meteorological Society under Contract AF 19(604)-1936, June **1957.** 41 p. Includes tables and figs.—After briefly summarizing the uniform, specific meteorological characteristics of the stratosphere, the author presents a comprehensive discussion of methods of stratospheric investigation including abnormal sound propagation, meteor observations, searchlight rays, airplanes, balloons and rockets; the composition of the stratosphere including the distribution of the atmospheric gases in the stratosphere, of ozone and of water vapor; transport processes in the stratosphere as indicated by O_3 and H_2O traces; radiation balance; temperature distribution and variations up to 100 km altitude, irregular periodic oscillation of temperature, annual variation of temperature; stratospheric winds and solar influences upon weather. (*Same item as* 9.1–171 and 12D–168, *Met. Abs.*) *Subject Headings:* **1. Stratospheric structure 2. Stratospheric temperatures 3. Stratospheric winds 4. Stratospheric research.**—*I.L.D.*

12H–74 551.571.7:551.593.54:662.2:539.1

Mackenzie, J. K., **Unusual frost points and dust haze in the stratosphere on March 9 and 10, 1955.** *Meteorological Magazine*, London, 85(1010):233–237, Aug. **1956.** 2 figs., 2 tables, 2 refs. **DWB**—In 1954 mean frost point at 45,000–50,000 ft over S. England (35 ascents) was −116°F, and only above −105°F once (Aug. 5, −89 to −99°F). On March 9, 1955, it was −89 to −91°F, falling to normal by March 11. Very thin haze was present above 32,000 ft on March 9. Haze and excess water vapor may have been due to the atomic explosion in Nevada on March 2. (*Same item as* 8.2–209, Feb. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. Haze layers aloft 3. Atomic explosions 4. England.**—*C.E.P.B.*

1957

12H–75 551.506.7:629.13(612)

§*Helliwell, N. C. and Mackenzie, J. K. (*Met. Office*), **Observations of humidity, temperature and wind at Idris, May 23–June 2, 1956.** *Great Britain. Meteorological Research Committee, M. R.*

Paper, No. 1024, April 12, **1957.** 10 p. 22 figs., 8 tables, 3 refs. **DWB** (M(055) G786m)—Results of 17 meteorological flights made from 35,000 to 48,000 ft, May 23–June 2, 1956 over the desert regions of Tripoli (3 flights) or over Idris (32°40′N, 13°10′E) at selected levels up to 48,000 ft are analyzed, discussed individually and presented in tables, charts, etc., with accompanying synoptic charts. The main emphasis is on the variations in absolute humidity as evidenced by the frost point, which was −82.6°C compared with −82°C over England. At 10,000 to 36,000 ft the frost point is much higher over Idris than over England (mean height of tropopause is 38,600 ft at Idris, with cooling to the tropical tropopause above 44,000 ft, whereas in England warming occurs above 38,000 ft). *Subject Headings:* **1. High altitude flights 2. Upper air observations 3. Absolute humidity variations 4. Tripoli.**—*M.R.*

12H–76 551.524.7:551.571.7

Helliwell, N. C.; Mackenzie, J. K. and Kerley, M. J., **Some further observations from aircraft of frost point and temperature up to 50,000 ft.** *Royal Meteorological Society, Quarterly Journal*, 83(356): 257–262, April **1957.** 3 figs., 2 tables, 6 refs. **DWB**—Forty-six airplane observations with a pressurized frost-point hygrometer and flat-plate thermometer up to 50,000 ft during 1955 are tabulated. Mean frost point in 1954 and 1955 combined was −117°F at 48,000 ft and −115°F at 46,000 ft. (*Same item as* 8.8–233, Aug. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air humidity 2. Upper air temperatures 3. British Isles.**—*C.E.P.B.*

12H–77 551.507.352:551.508.953:551.521.18

Houghton, J. T.; Moss, T. S.; Seeley, J. S. et al., **Some observations of the infra-red solar spectrum from a high-flying aircraft.** *Nature*, London, 180(4596):1187–1188, Nov. 30, **1957.** fig. **DWB**—Strong absorption bands of water vapor and CO_2 in infrared obscure much of the solar spectrum from the ground. A spectrometer and heliostat were installed in an aircraft. Successful ascents were made at 1.8 to 2.1μ to 45,000 ft. The amount of water vapor in a vertical column of air above 45,000 ft at Farnborough in August would be about 5% of precipitable water. (*Same item as* 11.2-137, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Infrared solar spectra observation techniques 2. Airplane infrared spectrometers I. Hawkins, T. D. F.**—*C.E.P.B.*

12H–78 551.593.653(485)

†Ludlam, F. H. (*Imperial College, London*), **Noctilucent clouds.** *Tellus, Stockholm*, 9(3):341–364, Aug. **1957.** 15 figs., table, 58 refs. Transl. into Russian with title **Serebristye oblaka,** in *Uspekhi Fizicheskikh Nauk, Moscow*, 65(3):407–440, **1958.** 15 figs., table, 58 refs. **DLC, DWB**—Knowledge of noctilucent clouds is reviewed, and fresh observations made in Sweden are described. The conditions under which the clouds may be seen are calculated and compared with observations; it appears that the clouds are formed only in summer in high altitudes. The sizes and concentrations of the cloud particles are inferred, and the problem of their composition and origin is discussed. The substance of noctilucent clouds may be true ice clouds, or their particles may be composed of some other material. A condensation at the 80 km level could be expected only if the temperature there became abnormally low, or if the air were abnormally humid, containing water vapor. The author assumes that the clouds are not likely to be formed by condensation of water vapor, but are more probably dust clouds derived from great eruptions, very large meteorites, and from interplanetary space. Evidence of dust in the stratosphere is assembled, and the process by which it appears in invisible clouds is discussed. *Subject Headings:* **1. Noctilucent clouds 2. Sweden.**—*Author's abstract.*

12H–79 551.510.53:016

†Martin, Clyde D., **High altitude weather affecting background radiation.** North American Aviation, Inc., Contract AF 33(600)-24347, [Unnumbered report], April 15, **1957.** 95 p. 5 figs., 6 tables, over 500 refs. **DWB** (M10.53 M379h)—A systematic review of knowledge to date and literature on: 1) high altitude clouds (cirrus, contrails, nacreous and noctilucent clouds); 2) water vapor in the upper stratosphere and lower troposphere; 3) ozone; 4) carbon dioxide and 5) dust. Each section has a thorough bibliography and in addition there are 18 pages of supplemental bibliographies classified according to the above subject areas. (*Same item as* 9.1–24, Jan. 1958, *Met. Abs.*) *Subject Headings:* **1. Cirrus cloud bibliographies 2. Ozone bibliographies 3. Carbon dioxide bibliographies 4. Meteoric dust bibliographies 5. Water vapor bibliographies.**—*M.R.*

12H–80 551.510.53:551.557:551.524.7:551.511.12

†Murgatroyd, R. J., **Winds and temperatures between 20 km and 100 km—a review.** *Royal Meteorological Society, Quarterly Journal*, 83(358):417–458, Oct. **1957.** 9 figs., 7 tables, bibliog. p. 454–458, 19 eqs. **DWB–DLC**—This useful summary attempts to synthesize all information on winds and temperature up to 100 km or more. Theoretical considerations are followed by a summary

of experimental methods and available measurements. Noctilucent clouds at 80 km generally agree with visual observations of meteors. The author concludes, that it is not known for certain whether these clouds are composed of ice or dust of either volcanic or meteoric origin. The first two require the existence of convective exchange from the earth's surface to their level. (For abstract on the entire article *see* 12D–176, April 1961, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. Noctilucent clouds.**—*E.K.*

1958

12H–81 551.510.5:551.508.762:551.574.1

Driving, A. Ia.; Zolotavina, N. V.; Polozova, M. N. and Smirnova, A. I., **Stratifikatsiia atmosfery i obrazovanie produktov kondensatsii po dannym prozhektornogo zondirovaniia.** [Atmospheric stratification and the formation of condensation products according to data from searchlight soundings.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:613–624, **1958.** 13 figs., 12 refs. **DLC.** Transl. into English in the corresponding number of its **Bulletin of the Academy of Sciences, USSR, Geophysics Series. DLC**—Searchlight soundings of the atmosphere in polarized light carried out in the Moscow Oblast are compared with aerological data and weather maps. The results of the optical soundings indicate the following: when the maps of baric topography show in the region of sounding, the presence of a marked center of high pressure with a rather intense cyclone to the north or southeast of it and when the thermoisopleths show vertical cooling over the point of observation, the soundings reveal the presence of aerosol in the troposphere and stratosphere. When these meteorological conditions are absent the thermoisopleths are different; they do not show cooling vertically and sounding does not disclose either strongly scattering haze or aerosol layers. In such cases the intensity of light scattering gradually diminishes and is the result of diffusion by aerosol with a radius less than 0.1μ, as well as by molecules. When the presence of aerosol in the stratosphere at the moment of sounding is well correlated with vertical cooling in the entire layer the aerosol is primarily a product of condensation. The condensation products in the stratosphere at heights of 14 to 23 km in these cases consist of water droplets with the predominant size of 1.5μ regardless of the latitude of the place of observation. *Subject Headings:* **1. Searchlight soundings 2. Stratification of atmosphere 3. Condensation of water vapor.**—*I.L.D.*

12H–82 551.508.25:551.521.18

Gates, David M.; Murcray, David G.; Shaw, Clyde C.; and Herbold, Robert J. (*all, Univ. of Denver, Colo.*), **Near infrared solar radiation measurements by balloon to an altitude of 100,000 feet.** *Optical Society of America, Journal*, 48(12):1010–1016, Dec. **1958.** 5 figs. (incl. photos), table, 6 foot-refs., 3 eqs. **DLC**—The first recordings of the near infrared solar spectrum from high altitudes were made by an infrared spectrograph carried to an altitude of 102,000 ft by a skyhook plastic balloon on June 22, 1955, between 0559 and 0830 MST. The total absorption in the 1.9-micron water vapor absorption band and in the 2.0-micron carbon dioxide absorption band was measured as a function of altitude. The amount of absorbing constituent above each level was determined. Some indication of the pressure dependence of the carbon dioxide absorption is determined. A comparison is made with other vapor measurements in the atmosphere. A description of the infrared spectrograph, the recording equipment, and of the biaxial pointing control is given. (*Same item as* 11.2–141, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Near infrared radiation measurement techniques 2. Infrared spectrographs 3. Air-borne instruments.**—*Authors' abstract.*

12H–83 551.510.53:551.507.352:061.6(420)

Helliwell, N. C. (*Met. Office, Farnborough*), **Research at high altitudes by the Meteorological Research Flight.** *Weather*, London, 13(9):287–292, Sept. **1958.** 4 figs., 6 refs. **DWB**—The author describes some of the investigations made by the Meteorological Research Flight at Farnborough to study conditions in the upper troposphere and lower stratosphere. Mosquito and Canberra aircraft with ceilings of 40,000 and 50,000 ft respectively were used. Humidity measurements were made with the Brewer and Dobson frost-point hygrometer. The frost point at the tropopause was found to vary greatly but generally was comparatively low when the tropopause is high and vice versa. Above the tropopause the frost point falls sharply with height and since the temperature is nearly constant in this height range the relative humidity falls quickly to very low values. After this initial decrease the frost-point falls less quickly with height; from −50°C and −78°C it reaches a value of −83°C at 40,000 ft. For air to be as dry as indicated by a frost-point of −83°C the air temperature must sometimes have been near this value and probably a little lower. Such air temperatures are found normally only at the equatorial tropopause and in winter, at high levels over the poles. A series of latitudinal flights indicated that in the lower stratosphere the humidity in middle latitudes depends principally on the current synoptic situation. At higher levels near 48,000 ft the latitudinal variation is negligibly small and does not attain deductions on the meridional flow at these levels. The meteorological conditions under which condensation trails form were studied by

means of a camera mounted on a Canberra and pointing backwards and graphs giving length of Canberra contrails for varying temperatures and humidities are presented. (*Same item as* 12.1 290, Jan. 1961, *Met. Abs.*) *Subject Headings:* **1. High altitude research 2. Airplane investigations 3. Frost point 4. Contrails 5. Farnborough, Eng.**—*I.L.D.*

12H–84 551.508.21:535.33

Houghton, J. T.; Moss, T. S. and Chamberlain, J. P., **An airborne infra-red solar spectrometer.** *Journal of Scientific Instruments*, N. Y., 35(9):329–333, Sept. **1958.** 9 figs., 7 refs. **DLC** (Q184.J6)—A grating spectrometer developed for installation in a Canberra aircraft is described. An electronically operated heliostat maintains an image of the sun on the entrance slit. Resolution of 2 cm^{-1} is achieved with a lead sulphide detector. Preliminary results are given for the 2μ region for heights up to 45,000 ft. Tracings of the region 1.8–2.1μ at different altitudes obtained at mid-day on August 1957 are shown. The 1.9μ water vapor absorption band is clearly shown. It is found that water vapor absorption disappears at the higher altitudes. *Subject Headings:* **1. Grating spectrometers 2. Water vapor absorption bands.**—*Authors' abstract and E.Z.S.*

12H–85 551.5(02) 551.571.2

*†Khrgian, Aleksandr Khristoforovich, **Fizika atmosfery.** [Physics of the atmosphere.] 3rd ed. Moscow, Gos. Izdat. Fiziko-Matematicheskoĭ Literatury, **1958.** 476 p. 218 figs., 116 tables, numerous refs., bibliog. p. 472. **DLC** (QC880.K45 1958)—This new edition of Khrgian's competent text on the physics of the atmosphere (for abstract on first ed., 1953, *see* 5.7–7, July 1954, *Met. Abs.*), contains about the same amount of tabular and illustrative material on the quantitative aspects of meteorology as did the 1953 edition, but has been amplified by inclusion of recent data and findings. In Ch. 4 (p. 59–67) water vapor is discussed. Specific and relative humidity measurements undergo sudden decrease at the limit of the stratosphere. Observations carried out in England show values of specific humidity from 0.8 to 12.10^{-3} g/kg. Temperature and dew-point distribution according to soundings in the U. S.—up to 30 km—showed an increase of humidity at 12.7 and 16.7 km. T. T. Romantsov (1948) investigating scattering and polarization measured water droplets from 0.2–0.5μ in diameter, and ice crystals from 0.25–0.7μ. At the altitude of 22–30 km mother-of-pearl clouds were observed. (For abstract on the whole book *see* 11B–71, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Atmospheric physics textbooks 2. Meteorology textbooks 3. Water vapor distribution 4. Nacreous clouds.**—*E.K.*

12H–86 551.507.321:551.521.18:546.214

Murcray, David G.; Brooks, James N.; Murcray, Frank H. and Shaw, Clyde C. (*all, Dept. of Physics, Univ. Denver, Colo.*), **High altitude infrared studies of the atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 63(2):289–299, June **1958.** 12 figs., table, 3 refs. **DLC.** Also issued as Denver Univ. Dept of Physics, Contract AF 19(604)-1005, Scientific Report, No. 1, **1957.** 24 p. 13 figs. (incl. photos), 3 refs., eqs. **DWB** (M21.61 M973s)—The results obtained from a flight with a balloon-borne infrared spectrometer are described. The spectrometer was designed to scan from the visible to 4.3 microns, but on this flight only the region from the visible to 2.7μ was obtained. In this region, the bands of interest are 1.4μ and 1.9μ H_2O bands. Spectra were obtained from the ground to 65,000 feet. The water vapor bands had completely disappeared above 46,000 feet. *Subject Headings:* **1. Infrared spectroscopy from balloons 2. Water vapor absorption bands.** —*Authors' abstract.*

1959

12H–87 551.593.653(473)

Deirmendjian, Diran and Vestine, E. H. (*both, Rand Corp., Calif.*), **Some remarks on the nature and origin of noctilucent cloud particles.** *Planetary and Space Science*, N. Y., 1(2):146–153, April **1959.** 2 figs., table, 11 refs., 2 eqs. **DWB**—Continuous spectra of the light from noctilucent clouds, recently obtained by N. I. Grishin near Moscow, U.S.S.R., are analyzed after accounting for the selective attenuation of the lower atmosphere and the spectrum of sunlight. It is found that the spectra may be explained in terms of primary scattering of direct sunlight by dielectric spheres with a maximum radius of 0.4μ, and certain night sky emissions. The apparent absence of any nocturnal ozone layers above 35 km is also noted. The possibility of an ice composition of the clouds formed by condensation of terrestrial water vapor is examined and found unjustified on physical grounds. Rather a silicaceous or similar composition and an interplanetary origin for the cloud particles is favored and a close relation with the Martian "blue haze" is suggested. (*Same item as* 11.6–369, June 1960, *Met. Abs.*) *Subject Headings:* **1. Noctilucent clouds 2. Moscow, U.S.S.R.**—*Authors' abstract.*

12H–88 551.507.32:551.510.53:551.521:551.571.7

Dollfus, Audouin, **Quelques observations géophysiques et astronomiques effectuées en ballon dans la stratosphère.** [Some geophysical and astronomical observations by balloon in the strato-

sphere.] *Académie des Sciences, Paris, Comptes Rendus*, 249(23):2602–2604, Dec. 9, **1959.** 3 refs. **DWB, DLC**—Account of two balloon ascents in the stratosphere. The former aerostatical device, a group of 30 sounding balloons chained to a nylon rope 150 m long, carried into the stratosphere a gondola containing 140 kg automatic observation instruments. The second experiment involved 100 balloons along a 450 m cable making it possible to send up a load of 450 kg. The author mentions the instruments carried aloft and describes the observations made during these 2 ascents. The observations enabled to investigate the atmospheric diffusion at tropopause level and to take a measurement of the water vapor content of the stratosphere. Diffusing sheets extending like perfectly stratified layers, often only some tens of meters thick, were observed at tropopause level. The measurements of water vapor content proved the little known fact that the atmosphere is saturated with water vapor through a great part of its depth. These results find application in certain astronomical observations. (*Same item as* 11.6–230, June 1960, *Met. Abs.*) *Subject Headings:* **1. Balloon clusters 2. Water vapor in stratosphere.**—*A.V.*

12H–89 551.593.652

†Driving, A. Ia., **O perlamutrovykh oblakakh.** [Mother-of-pearl clouds.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:410 421, March **1959.** 5 figs., table, 58 refs. **DLC**—The characteristics of mother-of-pearl clouds are summarized chiefly on the basis of studies of MOHR and STÖRMER. Searchlight soundings over Moscow compared with maps have shown that when maps of absolute topography of the 200 and 300 mb surface indicated the possible rise of air masses into the high altitude zone and aerological data indicated corresponding cooling along the entire layer with height, the aerosol observed in the stratosphere was a condensation product. Polarization data indicate that clouds at 22.2 km consist of particles 1.5μ in diamerer, close to the dimensions of the droplets of mother-of-pearl clouds. Since these clouds arise in the region of a high frontal zone then descending currents at corresponding altitudes should influence the variation of total ozone amount and its vertical distribution since ozone forms at these altitudes and its concentration is at a maximum. The comparison of observations of mother-of-pearl clouds and ozone measurements over Norway indicate that an increase of the total amount of ozone over Tromsø coincides with a rise in the frequency of occurrence of mother-of-pearl clouds. The maximum of these two processes coincides in time with the presence of winter stratospheric jet streams over northern Europe at altitudes responsible for the variation of the total ozone amount and for the formation of the mother-of-pearl clouds. (*Same item as* 11.7–393, July 1960, *Met. Abs.*) *Subject Headings:* **1. Nacreous clouds 2. Moscow, U.S.S.R. 3. Tromsø, Norway.**—*I.L.D. and author's summary.*

12H–90 551.501:551.571:533.4.551.571.7(47)

Kisleva, M. S.; Neporent, B. S.; and Fursenkov, V. A., **Spektral'noe opredelenie vlazhnosti vozdukha v verkhnikh sloiakh atmosfery.** [The spectral determination of water vapor in the upper atmosphere.] *Optika i Spektroskopia, Moscow*, 6(6):801–802, June **1959.** 3 figs., 13 refs. **DLC.** Transl. into English in *Optics and Spectroscopy*, Cambridge, Mass., 6(6):522–524, June **1959.**—Brief discussion of difficulties involved in the determination of water in the upper atmosphere is followed by a description of the equipment and a brief outline of the results obtained. Flights were made from the bases of the Central Aerological Observatory in the areas of Kharkov and Moscow. A chart indicates the variations of the concentration of water vapor at various altitudes. Data obtained in 1955, 1956 and 1957 are compared. Measurements of the moisture content by using the 1.4 micron band are successful up to about 11 km; at greater altitudes use is made of stronger 1.9 to 2.6 micron bands. Because of the complexity of the device in the flights of 1957, there is no hope of reliance on the data for the altitudes 11–14 km. The data are consistent with the results of other authors in the general behavior of the curves and the measured quantity of moisture. *Subject Headings:* **1. Water vapor measurements 2. Water vapor absorption bands. 3. Kharkov, U.S.S.R. 4. Moscow, U.S.S.R.**—*E.Z.S.*

12H–91 551.510.53:016

†Quiroz, Roderick S., **A survey of upper air climatological information sources.** *U. S. Air Weather Service. Climatic Center, Technical Memorandum*, 59–4, Sept. **1959.** 57 p. 2 tables, 128 refs. **DWB**—A selective, annotated bibliography of 128 references to climatic data for the atmosphere at high altitudes (mainly up to 100,000 ft) taken from files of the Air Weather Service Climatic Center. Each section contains a critical analysis of the literature from a climatological viewpoint. The major sections include: 1. heights of pressure surfaces, 2. upper air temperatures, 3. upper air winds, 4. moisture, 5. clouds, 6. density, 7. interrelations between the above parameters, 8. general surveys of upper atmosphere. The items are listed in reverse chronological order. Tables give height of pressure levels, principal series of mean constant pressure charts, isothermal charts and meteorological-statistical relationships. Maps, data compilations, variability and other aspects are used as subdivisions of the major headings. Many bibliographies (e.g., from *Met. Abstracts*) are listed

among the other items. An author index is appended. (*Same item as* 11.6–42, June 1960, *Met. Abs.*) *Subject Headings:* **1. Upper air bibliographies 2. Upper air humidity 3. Upper air temperatures 4. Upper air winds.**—*M.R.*

12H–92 551.501.771:551.508.71(02)

†Usol'tsev, Vladimir Aleksandrovich, **Izmerenie vlazhnosti vozdukha (metody i pribory).** [Measurement of atmospheric humidity: methods and instruments.] Leningrad, Gidromet. izdat., **1959.** 181 p. 29 figs., 16 tables, 108 refs., numerous eqs. **DWB** (M08.7 U86iz)—A systematic text reviewing in Pt. I the 16 different methods of measuring humidity in the air: 1) absorption, 2) condensation, 3) evaporation, 4) psychrometer, 5) salt psychrometer, 6) compensation psychrometer, 7) exchange, 8) thermo-electrolitic, 9) sorption, 10) diffusion, 11) dew point, 12) adiabatic dewpoint, 13) compressional dewpoint, 14) thermal conductivity, 15) infrared absorption and 16) dielectric permeability. Pt II takes up the tele-psychrometer; Pt. III, the thermo-electric hygrometer; Pt. IV, the diffusion hygrometer; Pt. V, the dewpoint hygrometer and Pt. VI, calibration methods. A good bibliography and auxiliary tables for computation of humidity are appended. (*Same item as* 11.9–12, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Hygrometry textbooks 2. Hygrometers 3. Humidity measurement techniques.**—*M.R.*

1960

12H–93 551.508.71:551.510.53:551.571.7(422)

Barclay, F. R.; Elliott, M. J. W.; Goldsmith, P. and Jelley, J. V. (*all, Atomic Energy Res. Estab., Harwell*), **A direct measurement of the humidity in the stratosphere using a cooled-vapor trap.** *Royal Meteorological Society, Quarterly Journal,* 86(368):259–264, April **1960.** 2 figs., 11 refs. **DWB, DLC**—A vapor trap designed for sampling the water vapor and carbon dioxide of the stratosphere is described. The results of one flight at about 27 km over southeast England are given. Graph shows the height-humidity mixing ratio distribution up to 30 km, derived from the reported results of various observers. (*Same item as* 12.4–201, April 1961, *Met. Abs.*) *Subject Headings:* **1. Stratospheric humidity instruments 2. Carbon dioxide in the stratosphere 3. Vapor trap 4. Southeast England.**—*Authors' abstract.*

12H–94 551.506:551.571:551.510.62:621.396.029.6

Chandra, Surech, **Space communication: effect of microwave absorption by water vapor in Earth's atmosphere.** *Institution of Telecommunication Engineers, New Delhi, Journal,* 6(6):252–255, Oct. **1960.** 3 figs., table, 13 refs., 2 eqs. **DLC**—The absorption of microwaves by water vapor for vertical transmission through the Earth's atmosphere has been calculated up to 30 km. The total absorption by water vapor comes out to be 0.06, 0.003 and 0.0002 db. at $v=30$, 10 and 3 kmc., respectively. The monthly variation of microwave absorption by water vapor at these frequencies has also been calculated for three representative places in India. It has been discussed that losses due to absorption become important for space-vehicle to earth communication. A frequency near about 3000 mc. has been chosen to be the best operating frequency for space communication. *Subject Headings:* **1. Space communication 2. Microwave absorption 3. Water vapor measurements.**—*Author's abstract.*

12H–95 551.510.53:551.507.362.2:551.521.18

Greenfield, S. M. and Kellogg, W. W. (*both, Rand Corp.*), **Calculations of atmospheric infrared radiation as seen from a meteorological satellite.** *Journal of Meteorology,* Boston, 17(3):283–290, June **1960.** 9 figs., table, 24 refs., 6 eqs. **DWB, DLC**—This paper shows sample calculations of the emission by water vapor in three wavelength intervals (at two places in the strong absorption band, 6.0 and 6.2μ, and in the region of weak absorption, 8 to 13μ). Water-vapor distributions used in these calculations are those for the United States, measured by the University of Chicago and showing rather high stratospheric humidities; for the United Kingdom, measured by the Farnborough Research Establishment and showing rather low stratospheric humidities; and for Swan Island, West Indies, where no humidity data were available above about 10 km. It is shown that, for very strong absorption by water vapor (as at 6.0μ) and the United States humidity distribution, the upward emission originates mostly in the stratosphere, whereas, for weaker absorption or lower stratospheric humidities, the upward emission comes mostly from below the tropopause. In the water vapor "window" at 8 to 13μ, about two-thirds of the upward emission in the vertical comes from the ground in middle latitudes (low humidities), but only about one-third of the surface radiation escapes in the tropics; i.e., the "window" is not at all transparent. (*Same item as* 11.J–58, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Weather satellites 2. Infrared radiation measurements 3. United States 4. United Kingdom 5. Swan Island, Caribbean Sea.**—*Authors' abstract.*

12H–96 551.521.3:551.571.7

†Gutnick, Murray, **An estimate of precipitable water along high-altitude ray paths.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 120, April **1960.** 31 p. 7 figs., 5 tables, 22 refs. **DWB, DLC**—Tables of the estimated water-vapor content of the atmosphere above 25,000 ft are presented for use in evaluating, for design purposes, the amount of attenuation which will be experienced during the travel of IR signals over various high-altitude ray paths. Due to lack of adequate data and conflicting theories of stratospheric moisture, two models of atmospheric moisture are presented, representing a very moist atmosphere during the wettest season and a very dry atmosphere during the driest season. Results are in terms of precipitable water integrated over the maximum line of sight between an aircraft at 25,000 to 100,000 ft altitudes and a ray path skimming a cloud layer at 25,000 ft. Latitudes of 40° and 60°N are considered. *Subject Headings:* **1. Precipitable water calculations 2. Atmospheric moisture models.**—*Author's abstract.*

12H–97 551.521.18:551.571.7

Hackforth, Henry L. (*Research Staff, Nortonics Northrop Corp.*), **Infrared radiation.** N. Y. McGraw-Hill, **1960.** 303 p. **DWB** (M21.3 H121in)—In Chapter 4, **Atmospheric Transmission of IR radiation,** p. 47–68. (6 figs., 6 tables, eqs. refs.), factors affecting IR transmission through the Earth's atmosphere are discussed. Of the primary constituents, water vapor is the principal attenuator of IR radiation. It was found that the concentration and distribution of water vapor up to 30,000 ft are continually changing, above this altitude the amount of concentration is extremely small in clear air conditions. In the stratosphere, recent measurements showed a relative humidity of less than 1 per cent. *Subject Headings:* **1. Vertical water vapor distribution 2. Infrared radiation transmission 3. Absorption by water vapor.**—*E.K.*

12H–98 550.3(02):551.5(02):533.4:551.571.7

†**Handbook of geophysics.** Rev. ed. Ed. by C. F. Campen, Jr.; A. E. Cole; T. P. Condron; W. S. Ripley; Norman Sissenwine and Irving Solomon. N. Y., Macmillan, **1960.** 22 ch. separately paged (680 p.) figs., tables, bibliogs., eqs. On t-p.: U. S. Air Force, Air Research and Development Command, Air Force Research Div., Geophysics Research Directorate. "First pub. in 1957 by the Air Force." (For abstract on 1957 ed., *see* 10.1–3, Jan. 1959, *Met. Abs.* For listing of articles in the 1957 ed., see Vol. 9, p. 1460, Nov. 1958, *Met. Abs.*) **DWB, DLC**—This remarkable and voluminous handbook is composed of 21 chapters covering various aspects of geophysics. Water vapor and ozone are discussed in ch. 8. (Atmospheric composition). The mixing ratio calculated for one sounding is shown graphically. Its variability in time and with altitude is illustrated up to 30 km. References to water vapor are also included in ch. 16 (Thermal radiation). Values for transmittance for individual absorption bands of H_2O and CO_2 between 0.9 and 20 microns measured under reduced pressure to simulate conditions at high altitudes are given. Two figures are included which permit the quick determination of the over-all transmission of a given band of H_2O or CO_2 as a per cent of the incident radiation in the spectral region included by the band limits and as a function of concentration and total pressure. Other figures show the principal features of the absorption bands of H_2O and CO_2 as measured by a low spectrometer plotted in terms of wave number and wave length. (For abstract on the entire 1960 ed. *see* 12 3–18, March 1961, *Met. Abs.*) *Subject Headings:* **1. Handbook of geophysics 2. Water vapor absorption bands 3. Design data handbooks.**—*E.Z.S.*

12H–99 551.501.7:551.571.73:551.524.73:551.551.5:551.557.5

Helliwell, N. C., **Airborne measurements of the latitudinal variation of frost-point, temperature and wind. Great Britain. Meteorological Office, Scientific Paper,** No. 1, **1960.** 30 p. 10 figs., 3 tables, 9 refs. **DWB**—The results of six flights in July and Aug. 1956 and three flights in March 1957 between 40°N and 68°N are presented together with diagrams showing the variation of frost point, temperature and wind. Little latitudinal variation of frost point at 46,000 ft (140 millibars) was found, and generally frost points in the lower stratosphere showed little variation except in the region of upper fronts or jet streams. Some of the flights showed evidence of frontal zones in the lower stratosphere. Some aspects of the clear air turbulence associated with jet streams are discussed and the location of turbulence with respect to the jet stream maximum and the tropopause is presented in a diagram using the data obtained on these flights. (*Same item as* 12.5–191, May 1961, *Met. Abs.*) *Subject Headings:* **1. Air-borne humidity measurements 2. Frost point measurements 3. Latitudinal variations in humidity 4. Stratospheric humidity measurements.**—*Author's abstract.*

12H–100 551.593.652

†Hesstvedt, Eigil, **On the physics of mother of pearl clouds.** *Geofysiske Publikasjoner*, Oslo, 21(9):Oct. **1960.** 32 p. 17 figs., 2 tables, 52 refs., numerous eqs. English summary p. 1. **DLC**—If 31.7 erg cm^{-2} is taken as the value of the specific free surface energy of an ice-water interface at 0°C, a good agreement is obtained between theoretically determined critical temperatures for homogeneous nucleation in supercooled water and freezing experiments reported by several investi-

gators. It is shown theoretically that pure water, formed below about −117°C, will remain supercooled (or vitreous) for a very long time. The temperatures in mother of pearl clouds are found to be −85°C to −100°C, and the concentration of condensation nuclei is about 0.5 cm^{-3}. The growth of the cloud particles is calculated for three cases: supercooled water droplets, ice spheres formed by sublimation and supercooled solutions of nucleus matter which freeze when the necessary degree of dilution is reached. Particle radii of 1.2μ or less have been found. It is shown theoretically that the particle size spectrum is very narrow, in agreement with the brilliant iridescence very often observed. A marked asymmetry in the shape of the clouds is found, not only in the case of supercooled droplets transforming into ice particles within the cloud, but also in the case of pure water clouds. *Subject Headings:* **1. Nacreous clouds 2. Cloud physics 3. Cloud particle size.**—*Author's abstract.*

12H–101 551.510.53:551.571.7:535.8(422)

Houghton, J. T. (*Clarendon Lab., Oxford*) and Seely, J. S. (*Univ. London*), **Spectroscopic observations of the water vapor content of the stratosphere.** *Royal Meteorological Society, Quarterly Journal*, 86(369):358–370, July **1960.** 5 figs., 2 tables, 12 refs., 8 eqs. **DWB, DLC**—The water vapor content of the stratosphere has been deduced from records of the solar spectrum observed from a Canberra aircraft at altitudes up to 48,000 ft. The spectral region 3790–3860 cm^{-1} in the 2.7μ band has been separated into four groups of absorption lines whose rates of growth have been studied. Measurements in an altitude chamber of the absorption of very small path of water vapor have been used to interpret the aircraft measurements in terms of absolute values of (pressure×quantity of water vapor)$^{\frac{1}{2}}$. Spectroscopic observations have been compared with measurements made by the frost-point hygrometer. The overall results show that the water vapor content in a vertical column above 45,000 ft over southern England is about 4.5μ, corresponding to a mixing ratio of 3×10^{-6}, if this is assumed constant above the height of observation. (*Same item as* 12.5–252, May 1961, *Met. Abs.*) *Subject Headings:* **1. Stratospheric water vapor content 2. Spectroscopic observations 3. Southern England.**—*Authors' abstract.*

12H–102 551.506:551.521:551.521.326:535.33

Katiushina, V. V., **O pogloshchenii HLα-izlucheniia Solntsa v atmosfere Zemli.** [Absorption of the solar Lyman-Alpha emission of hydrogen (HLα) in the earth's atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 10:1549–1552, Oct. **1960.** fig., 19 refs., 5 eqs. **DWB, DLC.** Transl. into English in the corresponding number of the *Akademiia Nauk SSSR, Bulletin of the Academy of Sciences, USSR, Geophysics series.* **DLC**—Variation in the intensity of the lines in the ultraviolet part of the solar spectrum, particularly of the (HLα) lines, is investigated for the correlation of the coefficient of absorption of atmospheric mass with intensity at different altitudes. Attention is given also to the effects of atomic hydrogen, water vapor and nitric oxide. Coefficient of absorption is computed with given equation and the results are tabulated and graphically illustrated. In order to explain the absorption by water vapor a large concentration of H_2O must be assumed at heights between 80–100 km. *Subject Headings:* **1. Emission phenomena 2. Lyman alpha observations 3. Water vapor.**—*N.P.S.*

12H–103 551.571.72:551.510.53

Mastenbrook, H. J. and Dinger, J. E., **Measurement of water-vapor distribution in the stratosphere.** *U. S. Naval Research Laboratory, NRL Report* 5551, Nov. 16, **1960.** 36 p. 25 figs., table, 18 refs. **DWB** (M(055) U586r)—The development of a dew-point radiosonde has been integrated with a series of balloon flights extending over a period of two years. This endeavor has sought to establish the reliability of the instrument by an appraisal of its performance and the consistency of the flight data obtained. The instrument incorporates the optical-electronic-thermal servo loop commonly used in automatic dew-point instruments and operates to control the temperature of a mirror surface such that a water or ice deposit is in equilibrium with the vapor in the air being sampled. The temperature of the mirror is measured and telemetered to give the frost point. Special attention has been given to problems related to contamination of the sample by extraneous moisture and to condensate characteristics. The data from a total of eleven flights are included. The flight data have been critically evaluated to point up problem areas in the instrument and flight procedures and to determine what flights have yielded valid data concerning the water distribution in the stratosphere. Selected portions, if not all, of the readings from six of the flights have yielded data considered valid. The last two flights, for which there is little question of data validity, show a minimum water-vapor content in the lower stratosphere (frost point of approximately −84°C at 55,000 ft) and an increasing amount with altitude above this level (frost point of −74°C at 100,000 ft). A more extensive flight program appears desirable to determine whether a moisture gradient in the stratosphere, as indicated by these flights, is generally found to exist as time and geographical location are varied. *Subject Headings:* **1. Water vapor distribution 2. Water vapor measurement techniques.**—*Authors' abstract.*

12H–104 551.521.3:535.34

Murcray, David G.; Brooks, James N.; Murcray, Frank H.; and Williams, Walter J. (*all, Univ. of Denver, Dept. of Physics, Denver, Colorado*), **Atmospheric absorption in the near infrared at high altitudes.** *Optical Society of America, Journal*, 50(2):107–112, Feb. **1960.** 7 figs., table, 8 refs. **DLC**—Also issued as Denver University Dept. of Physics, Contract AF 19(604)-2069, Scientific Report No. 1, March 19, **1958.** 17 p. 7 figs., table, 6 refs., 3 eqs. **DWB**—The results of a flight with a balloon borne spectrograph are presented. Solar spectra of the region from 1 to 5μ were obtained at altitudes 60,000 to 100,000 ft. The atmospheric absorption data obtained from these spectra are compared with theoretical predictions of slant path absorption and with laboratory data for constant pressure path. It was found that the 2.7μ atmospheric absorption band is the result of absorption by water vapor and carbon dioxide. From the records obtained it would appear that the water vapor above 60,000 ft may occur in "clouds" rather than being uniformly distributed. *Subject Headings:* **1. Solar spectra 2. Balloon-borne spectrograph 3. Absorption by water vapor.**—*Author's abstract and E.K.*

12H–105 551.510.53:551.571.7(789)

Murcray, David. G.; Murcray, Frank H.; Walter J. et al., **Water vapor distribution above 90,000 feet.** *Journal of Geophysical Research*, Wash., D. C. 65(11):3641–3649, Nov. **1960.** 2 figs., table, 30 refs., eqs. **DWB, DLC.** Also issued as Denver. Univ. Dept. of Physics, Contract AF 19(604)-2069, Scientific Report No. 5, May 24, **1960.** 15 p. 2 figs., table, 31 refs., eqs. **DWB** (M21.13 D416sc)—The absorptions due to the 6.3μ band of water vapor have been assumed for altitudes up to 92,000 ft. On the basis of these absorptions the humidity mixing ratio for the region above 92,000 ft has been calculated. The calculated values range from 1.5×10^{-4} g/g. The mixing ratio from 40,000 to 92,000 ft has also been calculated and yields values at least one order of magnitude lower than the values obtained above 92,000 ft. It is concluded that there was at least 20 microns of precipitable water above 92,000 ft over Alamogordo, N. Mex. on June 19, 1959. (*Same item as* 12.5–320, May 1961, *Met. Abs.*) *Subject Headings:* **1. Water vapor absorption bands 2. Vertica, water vapor distribution 3. Water vapor in stratosphere 4. Alamogordo, N. Mex. I. Lesliel Frank E.**—*Authors' abstract.*

12H–106 551.507.321:551.508.953:551.571.7:535.33

Murcray, David G.; Murcray, Frank H.; Williams, Walter J. et al., **A study of the 1.4μ, 1.9μ and 6.3μ water vapor bands at high altitudes.** Denver. Univ. Dept. of Physics, Contract AF 19(604)-2069, Scientific Report, No. 4, Feb. 18, **1960.** 11 p. 12 figs., 2 tables, 8 refs., eqs.—On March 13, 1959, the infrared solar spectrum from 1 to 10μ was recorded at altitudes up to 90,000 ft by means of a balloon-borne spectrometer flown in conjunction with a biaxial pointing control. The amount of water vapor present at these altitudes was also measured by means of a frost point hygrometer. Infrared absorption depends not only on the amount of absorbing material traversed by the radiation but also on its pressure environment. Various methods have been advanced for predicting the absorption that would be suffered by radiation traversing a slant path in the atmosphere. CARPENTER et al have shown that the absorption should be equivalent to that suffered by radiation traversing a constant pressure path through an amount of absorbing gas given by

$$u_e = \int_{h_1}^{h_2} \frac{a(h)}{a_s}\, p(h)\, dh.$$

Kinetic theory predicts that neglecting temperature effects

$$a = \frac{p}{p_s}\, a_s. \qquad \text{Thus} \qquad u_e = \int_h \frac{p(h)}{p_s}\, p(h)\, dh$$

which is equivalent to that predicted by CURTIS. The laboratory studies of HOWARD et al. indicate that for constant pressure paths

$$u_e = \int_0^x \left(\frac{p}{p_s}\right)^k p(x)\, dx$$

where k varies brom band to band. This suggests that $a = \left(\frac{p}{p_s}\right)^k a_s$ and that u_e should be calculated from

$$u_e = \int_{h_1}^{h_2} \left(\frac{p(h)}{p_s}\right)^k p(h)\, dh$$

The absorptions were calculated for the 1.4μ, 1.9μ and 6.3μ bands using both expressions, the hydrometer data and the laboratory data of HOWARD et al. Comparison of the calculated and observed

absorptions indicates that the expression using $u_e = \int_{h_1}^{h_2} \left(\frac{p}{p_s}\right)^k p\,dh$ gives better agreement with the observed values. (*Same item as* 11.9–199, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Balloon-borne spectrometers 2. Infrared radiation measurement techniques 3. Water vapor spectroscopy. I. Leslie, Frank E.**—*Authors' abstract.*

12H–107 551.510.53(08)551.571.71(02)

Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** N. Y., Academic Press, **1960.** 586 p. figs., tables, refs., eqs. **DWB** (M10.5 R233ph). Review by M. G. Morgan in *Institute of Radio Engineers, N. Y., Proceedings,* 48(12):2045, Dec. **1960.** Review by E. V. Appleton in *Journal of Atmospheric and Terrestrial Physics,* London, 19(3/4):295, Dec. **1960.** Review by S. F. Singer in *Science,* 133(3459):1123–24, April 14, **1961. DLC**—This excellently edited collection of articles, reviewing current knowledge of the atmosphere above 60 km, consists of 12 chapters written by well-known authorities on the physics and chemistry of the upper atmosphere. As far as water vapor is concerned in Ch. I (p. 4) the following is to be found: the sun's ultraviolet radiation dissociates Nitrogen (N_2) partly to atomic nitrogen, though to a far smaller extent than in the case of oxygen; water-vapor (H_2O) is dissociated into atomic hydrogen (H) and hydroxyl (OH), and carbon dioxide (CO_2) into atomic oxygen (O) and carbon monoxide (CO). In Ch. II (p. 27) on Table III references to the presence of molecular H_2O are given. Its ratio by volume 10^{-5} to 10^{-2} and its variability are noted. The ratio is variable particularly in the troposphere and decreases in the stratosphere. Dissociation occurs in the mesosphere. (For abstract on the whole book *see* 12.4–1, April 1961, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere physics 2. Water vapor dissociation 3. Textbooks.**—*E.Z.S.*

1961

12H–108 551.593.653

Hesstvedt, Eigil (*Inst. for Weather and Climate Research, Blindern, Norway*), **Note on the nature of noctilucent clouds.** *Journal of Geophysical Research,* Wash. D. C., 66(6):1985–1987, June **1961.** 2 figs., 14 refs., 5 eqs. **DWB, DLC**—In determining the nature of noctilucent clouds the ice hypothesis is considered, in particular the rate of sublimation of water vapor under conditions prevailing in noctilucent clouds. Solid insoluble particles, which are most likely to occur at 82 km will act as sublimation nuclei. Noctilucent clouds are, therefore not unlikely to be real clouds, whose main constituent is H_2O. The occurrence of these clouds is more frequent after midnight than before. This might be explained by the ice hypothesis: when the irradiation of the layer at 82 km is somewhat reduced after sunset at the Earth's surface, the temperature decreases and sublimation may start. *Subject Headings:* **1. Noctilucent clouds.**—*E.K.*

12H–109 551.571.72:551.510.53

†Mastenbrook, H. J. and Dinger, J. E. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Distribution of water vapor in the stratosphere.** *Journal of Geophysical Research,* Wash., D. C., 66(5):1437–1444, May **1961.** 5 figs., 16 refs. **DLC**—The development of a relatively lightweight dew-point radiosonde was coupled with a flight program to measure the water vapor in the stratosphere. The technique of obtaining data on descent as well as on ascent provided a method for checking the internal consistency of single flight observations. Data from three flights which meet the criterion of such self consistency are presented. One flight gave data which showed an essentially constant mixing ratio of approximately 4×10^{-5} g/g through the stratosphere with some decrease above 72,000 feet. The other two flights show a low water-vapor content in a layer just above the tropopause with a mixing ratio 1/20 that of the first flight at an altitude of 55,000 feet. An increase in water vapor with altitude above this layer is observed, the increase being such as to give a mixing ratio for the three flights which is of the same order of magnitude at 100,000 feet. *Subject Headings:* **1. Water vapor distribution 2. Dew-point measurements.**—*Authors' abstract.*

12H–110 551.571.7:551.521.18(789)

Murcray, David G.; Murcray, Frank H. and Williams, Walter J., **Distribution of water vapor in the stratosphere as determined from infrared absorption measurements.** Denver. Univ. Dept. of Physics, Contract AF 19(604)-7429, Scientific Report No. 1, Jan. **1961.** 8 p. 4 figs., 15 refs., eqs. **DWB**—The infrared solar spectrum from 1μ to 10μ was observed at various altitudes from the ground to 90,000 ft over Alamogordo, N. Mex., April 18, 1960. By studying the variation with altitude of the 6.3μ water vapor band and making certain assumptions concerning the pressure dependence of the absorption, it has been possible to determine the distribution of water vapor with altitude up to 90,000 ft. The method used is discussed in detail. The results are presented as an altitude profile of the mixing ratio and found to be in good agreement with the results obtained by other investigators using different techniques. The amount of water vapor present above the peak

ltitude reached by balloon is also determined from the spectra. It is found that there was at least 1 microns of precipitable water vapor present above 90,000 ft over Alamogordo at the time of the light. *Subject Headings:* **1. Vertical water vapor distribution 2. Water vapor absorption bands 3. Precipitable water vapor 4. Alamogordo, N. Mex.**—*Author's abstract.*

12H–111 551.507.362.2:551.576.4

Hanel, Rudolf A. (*Goddard Space Flight Center, NASA, Wash., D. C.*), **Determination of cloud altitude from a satellite.** *Journal of Geophysical Research*, Wash., D. C., 66(4):1300, April **1961.** refs. **DLC**—Describes a method of determining the cloud altitude from a satellite. The method is based upon infrared absorption by CO_2 in the air layer above the clouds. A similar measurement in a water vapor absorption band will yield the total amount of water vapor above the cloud. The same method was used to detect water vapor on Venus with a balloon-borne instrument. Describes the wavelength bands suited for experiment. *Subject Headings:* **1. Satellite observation of clouds 2. Infrared absorption of carbon dioxide 3. Water vapor measurements.**—*A.H.K.*

SUPPLEMENTARY MATERIAL

12H–112 541.1:546.11:551.510:523.4

Biutner, E. K., **O dissipatsii vodoroda iz atmosfer planet.** [Hydrogen dissipation from planetary atmospheres.] *Akademiia Nauk SSSR, Doklady*, 124(1):53–56, Jan. 1, **1959.** 23 refs., 5 eqs. **DLC**—The water vapor dissociation in the upper layers of the Earth's atmosphere, described by many investigators listed in given references, is reviewed by the author with special attention to the magnitude of water dissipation from the planet surface. Concentration of atomic hydrogen due to the photo-dissociation of water vapor at high altitudes is evaluated by the measured intensity of the illuminocity of night sky. The rate of photo-dissociation of water vapor under intensive solar radiation in the region of 1860–1430 Å is discussed with reference to probability of the data given by other authors, particularly at the altitudes of 70–80 km. The velocity of dissipation, computed with the author's formula, is considered excessive. Therefore, another assumption is made that the upward diffusion current of atomic hydrogen is formed in the layer of water vapor dissociation which substantially affects the distribution of atomic hydrogen on height. This distribution and diffusion current are mathematically formulated and the equations are simplified with various assumptions. Finally, the velocity of dissipation of the Earth's hydrogen is computed for evaluation of stationary current of hydrogen (or water vapor) from the Earth's surface during a long period of time (4.10^9 years), which corresponds to about 1% of total amount of water on the Earth. HARTECK's and JENSEN's formulas are discussed in view of their erroneous assumption that the diffusion at layers below 80 km exceeds the convection movement of gas masses, however, the actual conditions are reversed. The author's equations and other considerations in his discussion are applied to the Mars atmosphere which probably also has the water vapor and oxygen. *Subject Headings:* **1. Water vapor dissociation 2. Solar radiation 3. Martian atmosphere.**—*N.P.S.* Ⓢ

PART III. CONTENTS OF RECENT SERIALS AND COLLECTED WORKS

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